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A REVIEW OF THE CEPHALOPODS OF THE GULF OF MEXICO[1]

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ABSTRACT

Three hundred and three specimens of cephalopods are reported upon, mostly captured by the U. S. Fish and Wildlife Service vessel OREGON in the Gulf of Mexico from 1950 to 1956. Thirty-five genera and 42 species are described and illustrated, of which 1 genus and 4 species are described as new. The following species are recorded as occurring within the confines of the Gulf of Mexico: *Spirula spirula, Rossia tenera, R. equalis, R. bullisi, R. tortugaensis, R. antillensis, Pickfordiateuthis pulchella, Lolliguncula brevis, Loligo pealei, Sepioteuthis sepioidea, Doryteuthis plei, Lycoteuthis diadema, Oregoniateuthis springeri, Abralia veranyi, Abraliopsis* sp., *Octopodoteuthopsis megaptera, Onychia caribaea, Onychoteuthis banksi, Ancistroteuthis lichtensteini, Pholidoteuthis adami, Architeuthis physeteris, Calliteuthis reversa, Bathyteuthis abyssicola, Illex illecebrosus, Ommastrephes pteropus, Chiroteuthis lacertosa, Mastigoteuthis* sp., *Grimalditeuthis bonplandi, Cranchia scabra, Vampyroteuthis infernalis, Opisthoteuthis agassizi, Tetracheledone spinicirrus, Octopus vulgaris, O. joubini, O. briareus, O. burryi, Danoctopus schmidti, Pteroctopus tetracirrhus, Benthoctopus januarii, Alloposus mollis, Tremoctopus violaceus* and *Argonauta argo*. This list increases the number of known species from the Gulf of Mexico from 26 to 42.

Teleoteuthis agilis Verrill is placed in the synonymy of *Onychia caribaea* Lesueur and the status of *Calliteuthis reversa* Verrill is discussed. On the basis of the present collections the Gulf of Mexico is considered to be an embayment of the open ocean with most of the cephalopodan fauna being derived from the North Atlantic. Less than 10 per cent of the cephalopods are endemic and apparently these are confined to benthic species. Since most of the collections were obtained by means of commercial trawls little is known concerning the presence of planktonic species and only 1 cranchiid is recorded.

INTRODUCTION

The present work was originally undertaken as a report upon the cephalopods captured in the Gulf of Mexico by the United States Fish and Wildlife Service vessel OREGON since the inception of

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her work in 1950. However, as the writing proceeded it was found that with very little additional work it could be made to encompass all of the known cephalopods of the region. The present study, therefore, which is almost monographic in nature, is the result.

A survey of the great mass of cephalopod literature reveals little pertaining to this region. Apparently the first mention is that of Lesueur in 1821 who recorded *Onychia caribaea* as living amongst the floating Gulf weed, and Orbigny did little more than repeat this in his monumental work of 1839. In 1868 Howell described *Loligo hemiptera* from the upper Gulf region, a species later shown to be *Lolliguncula brevis.*

Verrill (1882), in his report on the cephalopods of the northeastern coast of the United States, listed *Sepioteuthis sepioidea, Loligo gahi, Lolliguncula brevis, Sthenoteuthis* (= *Ommastrephes*) *pteropus* and *S. bartrami* as occurring in these waters. Of these 5 species the reference to *Loligo gahi* is erroneous as this species occurs along the coast of Peru and Chile. Evidently he confused it with Blainville's *Doryteuthis plei. Sthenoteuthis bartrami* has yet to be listed validly for the area. Johnson (1934), Robson (1932), and Adam (1937) all have given brief mention of Gulf of Mexico material but have not contributed in any major way to our knowledge of these waters.

In 1945 Pickford published a study of the littoral octopods of the Western Atlantic and listed three species; *Octopus vulgaris, O. briareus* and *O. joubini,* from the Gulf coast of Florida. Hedgpeth (1950) recorded *Loligo brasiliensis* from the Texas coastal jetties, but this was based upon an erroneous identification of *Lolliguncula brevis.* Beginning in 1950, the present author has published a series of papers dealing with the cephalopods of the West Indian faunal region, to which at least the lower part of the Gulf of Mexico belongs, and several of these pertain to the Gulf of Mexico. In 1954 the author published a brief review of the cephalopods of the Gulf in which 26 species were recorded.

In the present work 303 specimens of cephalopods have been examined, representing 35 genera and 42 species of which 1 genus and 4 species are described as new to science. This increases the number of species known to occur in the Gulf of Mexico from 26 to 42.

The Gulf of Mexico is generally considered to be a Mediterranean type basin by geologists and others, but a study of the cephalopodan

fauna shows that the Gulf has few of the characteristics of such a basin type. It is rather a somewhat constricted embayment of the open ocean with little in it to claim relationship to or to compare with the Mediterranean. The great depth of the sills of the Yucatan Channel and the Straits of Florida allows free entry and egress of deepwater forms which on the other hand are effectually prohibited from entering the Mediterranean Sea. Of the 42 species recorded, less than 10 per cent may be endemic to the Gulf of Mexico while the Mediterranean has long been noted for the number of endemic species it contains. Most of the remaining species from the Gulf are circumtropical warm water species or North Atlantic in origin. A full discussion of the relationships and geographical distribution of the species contained in this report is planned to be given elsewhere.

It should be pointed out that the great mass of the material reported upon here was obtained by the use of commercial trawls and only small samples were taken from the catches at infrequent periods. Also, the samples taken were only of those specimens which appeared to the collectors to be different from those previously obtained. As a result, the numbers and distribution of the species from the Gulf cannot be taken as of any biological significance and it may be that some closely related species have been overlooked.

Since the nets employed were of large mesh, few planktonic forms such as cranchiids were obtained. The use of night lighting and plankton nets should materially increase the number of these small species.

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Synopsis of the cephalopods of the Gulf of Mexico

Although little new has been discovered in the course of the present work as pertains to the phylogeny and classification of the cephalopods, the author has departed from the main system of classification, as used by most authors, and has adopted a somewhat modified version of the system as proposed by Naef (1912) based upon the structure of the cephalopodan shell. There seems to be little justification for the classical treatment as proposed by Orbigny (1839) and while certain aspects of the present classification, as given in the following synopsis, are not entirely cleared up, it is felt that the change will be beneficial and give a truer picture of the relationships found within the higher categories.

For our purposes the class Cephalopoda is divided into three subclasses, Nautiloidea, Ammonoidea and Coleoidea, the Coleoidea containing all of the living species of cephalopods with the exception of the genus *Nautilus*.

Synopsis

Subclass Coleoidea
- Order Sepioidea Naef
  - Family Spirulidae (Orbigny)
    - Genus *Spirula* Lamarck
      - *Spirula spirula* (Linnaeus)
  - Family Sepiolidae Keferstein
    - Genus *Rossia* Owen
      - *Rossia tenera* Verrill
      - *Rossia equalis* Voss
      - *Rossia bullisi*, n. sp.
      - *Rossia tortugaensis*, n. sp.
      - *Rossia antillensis* Voss
- Order Teuthoidea Naef

Suborder Myopsida Orbigny
- Family Pickfordiateuthidae Voss
  - Genus *Pickfordiateuthis* Voss
    - *Pickfordiateuthis pulchella* Voss
- Family Loliginidae Orbigny
  - Genus *Lolliguncula* Steenstrup
    - *Lolliguncula brevis* (Blainville)
  - Genus *Loligo* Lamarck
    - *Loligo pealei* Lesueur
  - Genus *Sepioteuthis* Blainville
    - *Sepioteuthis sepioidea* (Blainville)
  - Genus *Doryteuthis* Naef
    - *Doryteuthis plei* (Blainville)

Suborder Oegopsida Orbigny
- Family Lycoteuthidae Pfeffer
  - Genus *Lycoteuthis* Pfeffer
    - *Lycoteuthis diadema* (Chun)
  - Genus *Oregoniateuthis*, n. gen.
    - *Oregoniateuthis springeri*, n. sp.
- Family Enoploteuthidae Pfeffer
  - Genus *Abralia* Gray
    - *Abralia veranyi* (Rüppell)
  - Genus *Abraliopsis* Joubin
    - *Abraliopsis* sp.
- Family Octopodoteuthidae Berry
  - Genus *Octopodoteuthopsis* Pfeffer
    - *Octopodoteuthopsis megaptera* (Verrill)
- Family Onychoteuthidae Gray
  - Genus *Onychia* Lesueur
    - *Onychia caribaea* Lesueur
  - Genus *Onychoteuthis* Lichtenstein
    - *Onychoteuthis banksi* (Leach)
  - Genus *Ancistroteuthis* Gray
    - *Ancistroteuthis lichtensteini* (Ferussac and Orbigny)
- Family Pholidoteuthidae Adam
  - Genus *Pholidoteuthis* Adam
    - *Pholidoteuthis adami*, n. sp.
- Family Architeuthidae Pfeffer
  - Genus *Architeuthis* Steenstrup
    - *Architeuthis physeteris* (Joubin)
- Family Histioteuthidae Verrill
  - Genus *Calliteuthis* Verrill
    - *Calliteuthis reversa* Verrill
- Family Bathyteuthidae Pfeffer
  - Genus *Bathyteuthis* Hoyle
    - *Bathyteuthis abyssicola* Hoyle
- Family Ommastrephidae Gill
  - Genus *Illex* Steenstrup
    - *Illex illecebrosus* (Lesueur)
  - Genus *Ommastrephes* Orbigny
    - *Ommastrephes pteropus* Steenstrup
- Family Chiroteuthidae Gray
  - Genus *Chiroteuthis* Orbigny

Chiroteuthis lacertosa Verrill
Genus *Mastigoteuthis* Verrill
Mastigoteuthis sp.
Genus *Grimalditeuthis* Joubin
Grimalditeuthis bonplandi (Verany)
Family Cranchiidae (Prosch)
Genus *Cranchia* Leach
Cranchia scabra Leach
Order Vampyromorpha Pickford
Family Vampyroteuthidae Thiele
Genus *Vampyroteuthis* Chun
Vampyroteuthis infernalis Chun
Order Octopoda Leach
Suborder Cirromorpha Robson
Family Opisthoteuthidae Verrill
Genus *Opisthoteuthis* Verrill
Opisthoteuthis agassizi Verrill
Suborder Incirrata Grimpe
Family Octopodidae Orbigny
Genus *Tetracheledone* Voss
Tetracheledone spinicirrus Voss
Genus *Octopus* Lamarck
Octopus vulgaris Lamarck
Octopus joubini Robson
Octopus briareus Robson
Octopus burryi Voss
Genus *Danoctopus* Joubin
Danoctopus schmidti Joubin
Genus *Pteroctopus* P. Fischer
Pteroctopus tetracirrhus (Delle Chiaje)
Genus *Benthoctopus* Grimpe
Benthoctopus januarii (Hoyle)
Family Alloposidae Verrill
Genus *Alloposus* Verrill
Alloposus mollis Verrill
Family Tremoctopodidae Tryon
Genus *Tremoctopus* Delle Chiaje
Tremoctopus violaceus Delle Chiaje
Family Argonautidae Tryon
Genus *Argonauta* Linnaeus
Argonauta argo Linnaeus

Artificial key to the cephalopods of the Gulf of Mexico

I. 10 circumoral appendages, consisting of 8 arms and 2 tentacles; suckers stalked, the apertures surrounded by horny ring.
1. Eyes covered by a continuous membrane.
2. Internal shell coiled and chambered or rudimentary and straight.
3. Internal shell coiled and chambered.
Spirula spirula
3[1]. Internal shell straight, rudimentary; body short, rounded posteriorly, with round, lateral fins.

4. Left dorsal arm of the male hectocotylized by an increase in the number of rows of suckers and bordered ventrally by a broad membrane; middle suckers of the sessile arms enlarged.
5. Suckers of the tentacular club small, those of the dorsal rows not much larger than the others; enlarged suckers of the sessile arms decreasing gradually in size distally.
Rossia (Semirossia) equalis

5¹. Suckers of the tentacular club large, those of the dorsal rows 2 to 3 times the diameter of the remaining suckers; enlarged suckers of the sessile arms decreasing abruptly in size distally.
Rossia (Semirossia) tenera

4¹. Both dorsal arms of the male hectocotylized; suckers of the mid-portion of the sessile arms not greatly enlarged.
6. Tentacular clubs expanded, their suckers small to moderate in size and arranged in 6-10 rows.
7. Tentacular suckers small with narrow chitinous rings; sperm reservoir of spermatophore normal.
Rossia (Allorossia) bullisi, n. sp.

7¹. Tentacular suckers of medium size with broad chitinous rings; sperm reservoir of spermatophore half the diameter of the adjoining section and darkly pigmented.
Rossia (Allorossia) tortugaensis

6¹. Tentacular clubs not expanded, their suckers minute and in numerous rows.
Rossia (Austrorossia) antillensis

2¹. Internal shell a broad, feather-like gladius.
8. Fins round, laterally inserted, not united posteriorly.
Pickfordiateuthis pulchella

8¹. Fins united posteriorly, lateral or terminal in position.
9. Fins extending over 90 per cent of the mantle length.
Sepioteuthis sepioidea

9¹. Fins not occupying over 60 per cent of the mantle length.
10. Body short; fins rounded; female with spermatophore pad within the mantle cavity; gladius visible through the dorsum.
Lolliguncula brevis

10¹. Body elongate; fins rhombic in outline; spermatophore pad on lower lip of buccal membrane.
11. Lateral edges of gladius straight, thickened; teeth of tentacular sucker ring more or less of equal size.
Doryteuthis plei

11¹. Lateral edges of gladius curved, oval, not thickened on the edges; tentacular sucker teeth strongly unequal in size.
Loligo pealei

1¹ Eyes not covered by a continuous membrane.
2. Mantle free, articulating with the head and funnel by means of paired cartilaginous grooves and ridges at the nuchal region and on either side of the funnel.
3. Mantle locking apparatus simple, consisting of a longitudinal groove without transverse processes on the funnel and a corresponding ridge on the mantle.
4. Suckers on the hand part of the tentacular club arranged in 4 or less than 4 rows (tentacles missing in *Octopodoteuthopsis*).

5. Some of the suckers of the arms and/or tentacles converted into curved hooks.
   6. Arms with 2 rows of hooks.
      7. Fins drawn out to a point posteriorly, united; ventral surface of mantle with numerous rows of light organs.
         8. Ventral arms normal; 4 hooks on tentacular club, the proximal the smallest; 5 light organs on eye ball, the 1st and 5th large and oval.
            Abralia veranyi
         8¹. Ventral arms with 3 swollen light organs at tips; 5 light organs on eyeball.
            Abraliopsis morisii
      7¹. Fins not united posteriorly, distinctly rhombic in outline; posterior portion of the mantle projecting well beyond the fins; tentacles absent in juveniles and adults.
         Octopodoteuthopsis megaptera
   6¹. No hooks on arms.
      9. 2 rows of hooks and 2 rows of suckers on the hand part of the tentacular club.
         Onychia caribaea
      9¹. 2 rows of hooks only on the hand part of the tentacular club.
         10. Median ridge of the gladius showing through the dorsum; animal medium to large with no mother of pearl or golden sheen to the mantle.
            Onychoteuthis banksi
         10¹. Median ridge of the gladius not showing through the dorsum; the body with a mother of pearl sheen with golden highlights; animal small to medium.
            Ancistroteuthis lichtensteini
5¹. No hooks on either arms or tentacles.
   11. 5 large light organs on ventral periphery of eye ball; 10 large light organs within the mantle cavity.
      12. Arms subequal in length; no light organs on surface of mantle.
         Lycoteuthis diadema
      12¹. Latero-dorsal arms greatly elongate and bearing numerous light organs; lights organs in integument of mantle.
         Oregoniateuthis springeri
   11¹. No light organs known either internally or externally.
      13. Animal of medium size; fins occupying over half the mantle length and drawn out to a long point posteriorly; skin composed of closely set scales or blocks usually hexagonal in shape; suckers of the tentacular clubs mounted on long pedicels; no suckers on tentacular stalks.
         Pholidoteuthis adami, n. sp.
      13¹. Animal of large to gigantic size; fins a marginal fringe bordering the slender posterior point of the mantle; skin smooth; alternate cups and suckers along the entire length of the tentacular stalk.
         Architeuthis physeteris
4¹. Suckers on the hand part of the tentacular club arranged in more than 4 rows.

14. Mantle with numerous light organs on the ventral and lateral surfaces; ventral arms with 3, the remaining arms with 2 rows of light organs of which the ventral rows are the largest.
Calliteuthis reversa

14¹. Mantle with no light organs; either no light organs on arms or a single basal light organ on each of the 6 dorsal arms; eyes directed anteriorly; fins small.
Bathyteuthis abyssicola

3¹. Mantle locking apparatus not a simple longitudinal groove and ridge.

15. Mantle locking apparatus an inverted T with strong lateral processes.

16. Adhesive apparatus on tentacles indistinct; no folds or pockets in funnel groove.
Illex illecebrosus

16¹. A distinct carpal cluster on tentacular stalk; folds and side pockets in funnel groove; usually 0-2, sometimes 0-4 cups on the tentacular stalk proximal to last cup of carpal cluster.
Ommastrephes pteropus

15¹. Mantle locking apparatus ear-shaped (or fused in *Grimalditeuthis*).

17. Mantle locking apparatus ear-shaped.

18. Tentacular club with 4 rows of suckers on hand part.
Chiroteuthis lacertosa

18¹. Tentacular club with many rows of suckers on hand part.
Mastigoteuthis sp.

17¹. Mantle fused with funnel at point of articulation.
Grimalditeuthis bonplandi

2¹. Mantle fused with head dorsally and at either side of the funnel; mantle completely covered with tubercles.
Cranchia scabra

1¹. 8 circumoral appendages; no tentacles.

1. 8 arms and 2 filiform appendages, 1 located on either side between the bases of the 1st and 2nd arms; 1 or 2 pairs of fins; light organs present; suckers stalked, in a single series and alternating with pairs of cirri; small and gelatinous.
Vampyroteuthis infernalis

1¹. 8 arms, no filiform appendages; no light organs; suckers sessile.

2. Fins present; body flattened remarkably; cirri present on arms; suckers uniserial; arms nearly completely involved in the web.
Opisthoteuthis agassizi

2¹. No fins; body not flattened; no cirri present.

3. Suckers in 2 rows.

4. Large and conspicuous aquiferous pores on head; dorsal arms of female connected by a deep and broad web.
Tremoctopus violaceus

4¹. No aquiferous pores on head; dorsal arms of female not connected by a deep web.

5. Left 3rd arm of male hectocotylized.

6. Male minute; female with dorsal arms with broad terminal expansions modified for secretion of an external shell or egg case; pelagic.
Argonauta argo

6¹. No sexual dimorphism in size; female without terminal expansions of the dorsal arms and without egg case; 2 cirri over each eye; skin smooth.

Pteroctopus tetracirrhus

5¹. Right 3rd arm of male hectocotylized.

7. Arms very long, about 5 times the length of the mantle ligula index above 10.0.

Benthoctopus januarii

7¹. Arms usually not over 3 times the mantle length; ligula index below 8.0.

8. A dark purplish or brownish stripe on the dorsal surface of each arm bordering the suckers.

Octopus burryi

8¹. No dark band on arms.

9. Ligula index 3.0 or above; eggs large (8.0-9.0 mm)

10. Ligula index 4.0-7.0; arms short and subequal; gills about 6; animal small.

Octopus joubini

10¹. Ligula index 3.0-4.0, the ligula with about 13 transverse ridges; 2nd and 3rd arms conspicuously long and stout; gills about 6-8.

Octopus briareus

9¹. Ligula index below 2.6; eggs small (unknown in *Danoctopus*).

11. Ligula index below 2.5; 1st pair of arms much shorter than others; gills 7-11; animal large.

Octopus vulgaris

11¹. Ligula minute; undifferentiated; gills 9; arms subequal; mantle aperture narrow; web depth index about 48.5 and subequal; animal small.

Danoctopus schmidti

3¹. Suckers in a single row.

12. Body firm; covered with coarse sharp tubercles; suckers uniserial throughout; 2 large cirri over each eye; funnel organ 4-parted; ligula spade shaped; benthic.

Tetracheledone spinicirrus

12¹. Body gelatinous, smooth; suckers uniserial within web, biserial at border of web, and uniserial distally; hectocotylized arm of male carried in a pouch between 2nd and 3rd arms; animal small, benthic.

Alloposus mollis

Definitions of Measurements and Indices Used.

Measurements

TL — total length of the specimen from tip of sessile arms to posterior end of mantle, exclusive of the tentacles.

ML — dorsal length of the mantle from the anterior margin to the posterior end. In the octopods this measurement is from a point between the eyes to the end of the mantle.

MW — greatest width of the mantle.

HW — width of the head measured across the eyes.

HL — length of the head measured from the anterior edge of the line marking the position of the mantle to the base of the dorsal interbrachial area.

FL — length of the fin from the anterior border to the posterior border or the point of union of the fins, whichever is the greatest distance.

FW — greatest distance across both fins.

Arms I, II, III, IV — length of the sessile arms, dorsal, dorso-lateral, ventro-lateral and ventral, measured from the first basal sucker to the distal extremity of the arm (in octopods from the mouth to the distal end).
Web A, B, C, D, E — depth of the web sectors between the arms from between the dorsal pair to the ventral pair measured from the mouth to the mid-point of the margin of the web (used in octopods).
DSs — diameter of the aperture of the largest sucker of the sessile arms.
DSt — diameter of the aperture of the largest sucker of the tentacular club.
DO — diameter of orbit
SpL — length of spermatophore.
Hect. arm — length of the hectocotylized arm measured from the mouth to the end of the arm.
Ligula — length of ligula measured from distal sucker to tip of arm.

Indices

HWI — width of head expressed as a percentage of the mantle length.
HLI — length of head expressed as a percentage of the mantle length
MWI — width of mantle expressed as a percentage of the mantle length.
FLI — length of fins expressed as a percentage of the mantle length.
FWI — width of both fins expressed as a percentage of the mantle length.
MAI — length of longest arm expressed as a percentage of the mantle length.
ALI — length of longest arm expressed as a percentage of the total length.
LigLI — length of ligula expressed as a percentage of the hectocotylized arm.
SpLI — length of spermatophore expressed as a percentage of the mantle length.
SpRI — length of sperm reservoir expressed as a percentage of the length of the spermatophore.

Miscellaneous Abbreviations

Sta. — station (usually referring to OREGON stations).
M — male.
F — female.

Order SEPIOIDEA

Family SPIRULIDAE

Genus *Spirula* Lamarck, 1799

Spirula spirula (Linnaeus, 1758)

Fig. 1 a

Nautilus spirula Linnaeus, 1758, p. 710
Spirula spirula, Bruun, 1943 (Biology).

The only record of this species having been taken intact from the Gulf of Mexico is in a paper by Dall (1896) on a specimen obtained from the mouth of a deep sea fish. This specimen was trawled from 324 fathoms in the northern part of the Gulf of Mexico between the Mississippi Delta and Cedar Keys, Florida. The specimen was in excellent condition, only partly damaged by the teeth of the fish, and is deposited in the United States National Museum.

While Dall's specimen has not been available to the author during

the writing of this paper, two specimens in perfect condition taken by the ATLANTIS on the 2nd of March, 1954, in 18°37'N, 66°05'W have been available for study, and the following brief account is given from these specimens.

Description. The body is cylindrical with parallel sides, the lateral walls forming two lappets over the coiled, chambered shell which is visible dorsally and ventrally but is entirely enclosed within the mantle. The posterior end of the body is truncated and equipped with two laterally inserted fins whose planes are at right angles to the axis of the body. There is a terminal pore. Anteriorly the mantle margin is strongly produced as a rounded dorsal lobe which is emarginated posterior to the eyes. There are two strong lobes ventrally, one beneath each eye, and there is a deep hollow posterior to the funnel.

The *head* is large, the eyes produced far beyond the mantle width and these open to the exterior by a minute pore over the eyeball. The funnel barely projects beyond the mantle margin and appears to be rather weak.

The *arms* are short, stout, sharply pointed and subequal, the ventral pair the longest and the stoutest. They appear to carry four rows of minute suckers enclosed in a deep protective groove. The *tentacles* are short, somewhat stout, and bear numerous rows of minute suckers on the club.

The *shell* is snowy white, porcellaneous, closely coiled, and chambered by cup-shaped yellowish septa. These shells are found all along the shores of the Gulf of Mexico indicating a fairly large concentration of the adults in adjacent waters.

Holotype. British Museum?

Type locality. America!

Distribution. Widely distributed in various seas where it lives between about 200-1500 meters.

Family SEPIOLIDAE
Genus *Rossia* Owen, 1828

Rossia (Semirossia) equalis Voss, 1950
Figs. 1b, c

Rossia (Semirossia) equalis Voss, 1950, p. 73.

Material. 1 male, ML 28.0 mm, OREGON Sta. 314.
1 male, 1 female, ML 28.0, 34.0 mm, OREGON Sta. 34.
1 male, ML 39.0 mm, OREGON Sta. 550.
1 male, 3 females, ML 16.0-23.0 mm, OREGON Sta. 864.

Description. The *mantle* is short, subcylindrical, and slightly dorso-ventrally compressed, about half as wide as long. The anterior mantle margin is slightly produced in the mid-dorsal region. The *fins* are large, round and broad with prominent free lobes. The *head* is large and broad with prominent large eyes which have an orbit index of 16.5.

The *funnel* is long and slender and free for most of its length. The funnel

organ is an inverted V, small, and accompanied by small oval ventral pads.

The *arms* are long and slender, arranged in the order 3.4.2.1 with the dorsal pair much the smallest. The suckers of the sessile arms are arranged in two rows and are uncrowded. In the only specimens known the suckers of the middle portion of the arms are enlarged, but they decrease gradually towards the extremities. The suckers are globose, barrel-shaped, with round apertures which are untoothed. There is a very narrow papillated band midway of the chitinous ring.

The left dorsal arm is *hectocotylized* in the following manner. Proximally there are 10 pairs of suckers of normal size followed distally by about 4 rows of suckers of reduced size extending to the tip of the arm. Beginning at the third pair of suckers from the base of the arm is a wide lateral membrane which borders the suckers for about ¾ of the arm on the ventral side. The bases of the suckers bordering the membrane form a palisaded effect, and a ridge from each pedicel extends across the oral surface of the membrane in a pleated fashion.

The *tentacles* are long and slender with moderately expanded clubs which are bordered their entire length by a dorsal membrane which begins proximal to the first basal sucker. The stalk is round, flattened on its oral surface. The tentacular suckers are arranged in about 7-8 rows on the club. The most dorsal suckers are the largest, and they decrease in size towards the ventral margin. In the male of 39.0 mm the largest suckers are 0.3 mm in diameter, the smallest 0.2 mm. The chitinous rings are toothed around the aperture and surrounded by a broad band of papillations.

The *color,* in formalin, is a dark reddish purple composed of numerous and crowded small chromatophores over the arms, head and dorsal mantle surface. The pigmentation extends over about half of the fin surface while the remainder of the fin is unpigmented and yellowish white.

TABLE 1

Measurements (in mm) and indices of two specimens of *Rossia (Semirossia) equalis* Voss.

Sta.	314	550
Sex	M	M
ML	39.0	28.0
MWI	59.0	64.3
HWI	61.5	68.0
FLI	61.5	68.0
FWI	131.0	132.0
Arms		
I	31.0	19.0
II	33.0	24.5
III	36.0	30.0
IV	29.0	28.0
DSs	3.2	2.5
DSt	0.3	0.3
SpL	25.0	...

Holotype. U. S. National Museum.

Type locality. 100 fathoms off Pelican Shoal, Florida.

Distribution. Lower Florida Keys; Gulf of Mexico.

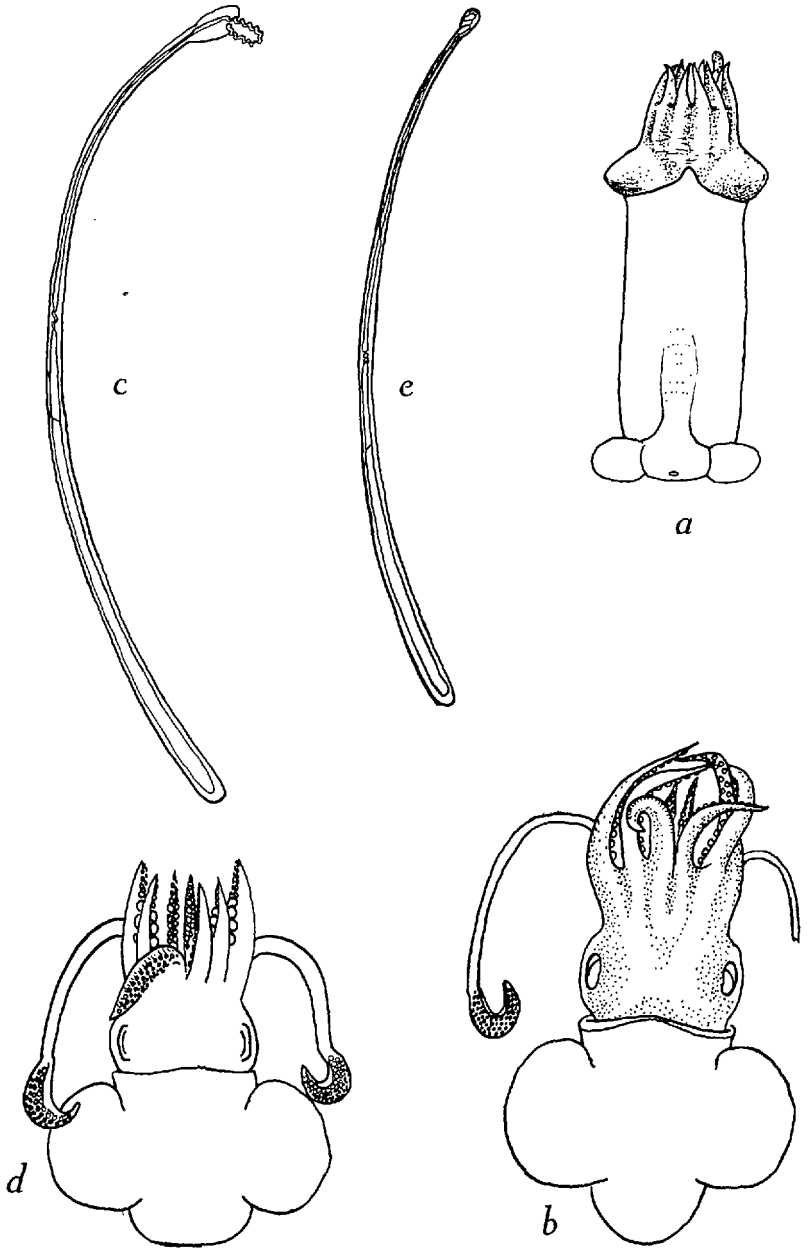

FIGURE 1. a. *Spirula spirula* (Linnaeus), dorsal view, mantle length 55.0 mm. b-c *Rossia equalis* Voss. b. Dorsal view of male, mantle length 39.0 mm. c. Spermatophore. d-e. *Rossia tenera* (Verrill). d. Dorsal view of male, mantle length 29.0 mm. e. Spermatophore.

Discussion. This species reaches a considerably larger size than does *R. tenera* Verrill and is found sympatrically with the latter. It is easily distinguished from it by the smaller relative size of the sessile suckers, the more gradual change in size, and by the character of the tentacular suckers, those of the dorsal two rows being only slightly larger than those of the ventral ones.

R. equalis does not seem to be as common as *R. tenera* which occurs in large numbers along the northeastern coast of the United States, but this apparent discrepancy in numbers may be due to inadequate collecting. The genus *Rossia* is coming into prominence, however, since many of its members are of considerable importance as food for fish. They are found on muddy or sandy bottom in fairly deep water.

The author does not agree with several recent workers who have suggested that the subgenus *Semirossia* deserves elevation to the rank of genus because of the enlarged sessile suckers and the modification of the left dorsal arm in the male. These characters seem too insignificant to warrant the action and would support raising others, such as *Austrorossia,* to generic rank.

Rossia (Semirossia) tenera (Verrill, 1880)
Figs. 1d, e

Heteroteuthis tenera Verrill, 1880, p. 392.

Material. 5 males, 1 female, ML 20.0-29.0 mm, from an undetermined OREGON station.

This species has been taken in the Gulf of Mexico by Henry S. Hildebrand off Port Aransas, Texas. While this material is no longer available, and the OREGON specimens are very mutilated, a specimen off Palm Beach, Florida, was collected by Thomas McGinty and is the basis for the following description.

Description. The *mantle* is short, subcylindrical, slightly dorso-laterally compressed and about ¾ as wide as long. The anterior mantle margin is sinuous and slightly advanced in the mid-dorsal line. The *fins* are of moderate size and occupy about 66.0 per cent of the mantle length. The anterior lobe is free. The *head* is large and bears prominent eyes.

The *funnel* is long and slender and is free for most of its length. The funnel organ is stout, shaped like an inverted V, with broad members and angled on the lower external border. The ventral pads are strongly angled and boomerang shaped.

The *arms* are moderately long and in the order 2.3.1.4, the dorsal pair rather long. The suckers of the male are distinctly enlarged in the mid-portion of the arm and extend to within a short distance of the tip where they abruptly de-

crease in size. The suckers are globose with small round apertures without dentition.

The left dorsal arm is *hectocotylized* in the male in the following manner. Proximally are seven pairs of normal suckers which thereafter become decreased in size and occur in 4 rows. At the third pair of proximal suckers a broad membrane originates which borders the arm on the ventral side for about ¾ of its length. Distal of the membrane, the arm is attenuated, and the suckers are again in 2 rows. The sucker pedicels bordering the membrane form a palisaded effect which is continued on the oral surface of the membrane as a fine pleat.

The *tentacles* are of moderate length with expanded clubs which are bordered dorsally by a membrane which originates proximal to the basal suckers and extends to the distal tip of the club. The tentacular suckers are arranged in about 6—7 rows. The dorsal suckers are about 0.4 mm in diameter while the ventral ones are about 0.2 mm in diameter. The apertures are toothed around the entire margin.

The *color* in alcohol is whitish with a few large scattered reddish purple chromatophores on the dorsal surface of the arms, head and mantle. The chromatophores are scattered about over the entire surface of the fins.

TABLE 2

Measurements (in mm) and indices of a male of *Rossia tenera* Verrill from off Palm Beach, Florida

ML	22.0	Arms	
MWI	72.8	I	19.0
HWI	77.3	II	19.0
FLI	66.0	III	16.0
FWI	123.0	IV	15.0
DSs	1.5		
DSt	0.4		
DO	4.5		

Holotype. Not traced, perhaps in Peabody Museum, Yale University.
Type locality. Off Newport, Rhode Island.

Distribution. Eastern North Atlantic; northern Europe; Ireland; Western North Atlantic from New England to Florida; the Gulf of Mexico; Caribbean Sea; Brazil.

Remarks. This species is very common along the Atlantic coast and probably also in the Gulf of Mexico. Its small size may account for its lack of capture by the commercial nets employed on the OREGON. These squids are among the commonest cephalopods in the deeper waters from New England to the West Indies. We know little if any of their ecology and habitat or of their importance in the fisheries.

Rossia (Allorossia) bullisi, n. sp.
Figs. 2a, b, c, d

Holotype. Male, ML 36.0 mm, OREGON Sta. 501.

Paratypes. 1 male, ML 40.0 mm, OREGON Sta. 639.
1 female, ML 41.0 mm, OREGON Sta. 382.
4 males, 6 females, ML 19.0-41.0 mm, OREGON Sta. 516.

Description. This species seems to be one of the commonest members of the genus *Rossia* in the Gulf of Mexico. It is a large species for the genus and offers several rather distinctive features.

The *mantle* is short, subcylindrical, saccular and longer than wide. The anterior margin is sinuous and well produced in the mid dorsal line. The *fins* are rather large, rounded and broad, and the anterior lobes are free. The mantle and the fins are thick and fleshy, almost flabby, as is characteristic of the deeper water *Rossia*. The *head* is wide and large with prominent eyes. A peculiar feature of all of the specimens with the exception of the holotype is the extreme contraction of the eyes and the resultant puckering of the eyelids.

The *funnel* is long and slender and free for its entire length. The funnel organ is an inverted V shape with small ventral pads which are elongate oval.

The *arms* are generally in the order 3.4.2=1 or 3.4.2.1 and are long, subequal, the dorsal pair slightly the shortest. The suckers of the sessile arms are nearly globular with round apertures and without dentition. In the males the suckers are somewhat larger than in the females. They are in 2 distinct rows.

Both dorsal arms of the male are *hectocotylized* by the presence of a bordering membrane on the ventral side of both arms which extends the full length of the arms.

The *tentacles* are long, triangular in cross section, with the dorsal surface flattened and with a median groove. The clubs are long, moderately expanded, and bordered dorsally by a membrane which originates proximal to the suckers and extends to the distal tip. The tentacular suckers are minute, about 0.175 mm

TABLE 3

Measurements (in mm) and indices of seven specimens of *Rossia (Allorossia) bullisi*, n. sp.

Sta.	501	639	382	516	516	516	516
Sex	M	M	F	F	F	F	F
ML	36.0	40.0	41.0	41.0	30.0	32.0	37.0
MWI	79.5	67.0	73.0	76.0	67.0	72.0	81.0
HWI	89.0	82.0	71.0	80.0	80.0	88.0	89.0
FLI	67.0	70.0	68.0	71.0	67.0	72.0	73.0
FWI	142.0	162.0	153.0	153.0	147.0	160.0	153.0
Arms							
I	30.0	42.0	34.0	25.0	....	....	....
II	28.0	35.0	39.0	37.0	....	....	....
III	32.0	45.0	38.0	38.0	....	....	....
IV	30.0	38.0	41.0	35.0	....	....	....
DSs	1.7	2.0	1.4	1.5	1.2	1.3	1.5
DSt	0.2	0.2	0.3	0.2	0.1	0.2	0.2

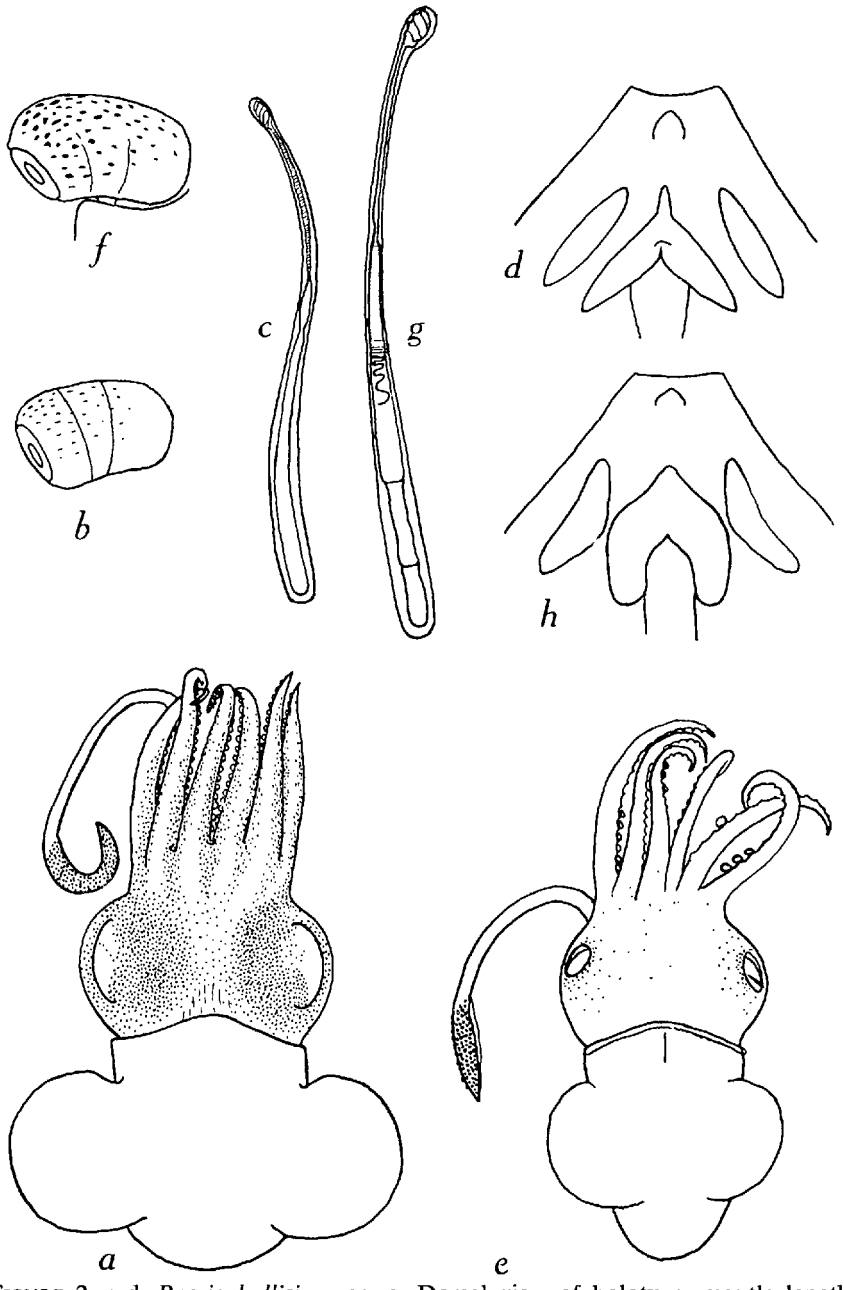

FIGURE 2. a-d. *Rossia bullisi,* n. sp. a. Dorsal view of holotype, mantle length 36.0 mm. b. Sucker of dorso-lateral arm. c. Spermatophore. d. Funnel organ. e-h. *Rossia tortugaensis,* n. sp. e. Dorsal view of holotype, mantle length 41.0 mm. f. Sucker of dorso-lateral arm. g. Spermatophore. h. Funnel organ.

in diameter. They are arranged in about 10—12 rows.

The *spermatophores* of the holotype were examined, and one is illustrated in Figure 1c. The SpLI is 42.0 and the SpRI is 50.0. The head is highly convoluted and the canal is coiled. The spermatophores are rather stout at the reservoir end. The width is about 6.5 per cent of the length.

The *color* is a yellowish white general background, the dorsal mantle surface densely covered with small reddish chromatophores which extend over the entire surface of the fins, although more scattered distally. Ventrally the surface is sprinkled with a small number of reddish chromatophores on the mantle and the anterior third of the fins. The ventral surface of the head and funnel is completely devoid of chromatophores. The ventral arms have a small number of chromatophores distributed over their ventral surface.

Holotype. U. S. National Museum.

Type locality. OREGON Sta. 501, 27°51′N, 91°32′W, in 220 fathoms on mud bottom, bottom temperature 50.0°F, November 11, 1951.

Distribution. Known only from the upper part of the Gulf of Mexico both east and west of the Mississippi River delta.

Discussion. The subgenus *Allorossia* formerly was comprised of only three Atlantic species: *R. glaucopis* (*sublaevis, hyatti*), *megaptera* and *caroli*. From these, *R. bullisi* is distinguished by several pertinent characters. The series at hand indicates that this species is considerably larger than *R. glaucopis* which is boreal and arctic in habitat and which has considerably larger suckers on the tentacular club. *R. caroli* may be eliminated by habitat and the presence of 6—7 rows of tentacular suckers, slightly over half of the number found in *R. bullisi*. It is most closely related to the following species, *Rossia tortugaensis,* from which it may be most easily distinguished by the small tentacular suckers with narrow chitinous bands.

Remarks. This species is named for Mr. Harvey E. Bullis, Jr., at present in charge of the operations of the OREGON and to whom the author is deeply indebted for the privilege of examining the specimens contained in this report.

Rossia (Allorossia) tortugaensis, n. sp.
Figs. 2e, f, g, h

Holotype. Male, ML 41.0 mm, 372-375 fathoms off Dry Tortugas, Florida, July 18, 1932. Leg. W. L. Schmitt.

Paratype. Female, ML 34.0 mm, 283 fathoms off Dry Tortugas, Florida, July 7, 1931. Leg. W. L. Schmitt.

Description. This species, at least superficially, is very closely related to *R. bullisi* but differs from it in certain important respects, especially in the structure

of the sessile arm suckers and the spermatophores.

The *mantle* is short, subcylindrical, saccular and rather soft and flabby. The mantle is rather wide and is somewhat produced in the mid dorsal line. The *fins* are large and broad, the anterior lobe only partially free. The *head* is wide and large with prominent eyes. In the holotype the eyelids are expanded while in the paratype they are puckered as in *R. bullisi.*

The *funnel* is long and slender and free for its entire length. The funnel organ is an inverted V in shape, thick and fleshy, and strongly angled in the lateral members which proximally are parallel. The ventral pads are heavy and sharply angled.

The *arms* are in the order 3.2.4.1 (holotype) or 4.3.2.1 (paratype) and are long. The suckers are arranged in 2 regular rows. They are peculiarly elongated and barrel shaped with narrow oval apertures which are without dentition. The outer surface of the suckers is liberally covered with large reddish purple chromatophores. There is no apparent sign of *hectocotylization* in the single male.

The *tentacles* are long, triangular, flattened orally and with a median groove. The club is large and bordered dorsally by a membrane which has its origin proximal to the first suckers and extends to the distal tip of the club. The tentacular suckers are arranged in about 10 rows. They are small, about 0.45 mm in diameter in the holotype and 0.35 mm in the paratype. They have wide apertures. The horny ring is finely toothed.

The *spermatophores* of the holotype are long and rather peculiarly constructed. One of these was stained and mounted. Posterior to the sperm reservoir of the normal type is a heavily pigmented, much reduced tube which extends posteriorly to the end of the capsule. It is much smaller in diameter than the sperm reservoir and is rather annulated in appearance. In this character it closely resembles *R. enigmatica* Robson and *R. mollicella* Sasaki, neither of which is found in the Atlantic.

The *color* is reddish purple. The rather large chromatophores densely cover the dorsal surface of the mantle, the fins and over the eyes. Ventrally these chromatophores are less prominent and they are completely lacking on the ventral surface of the head.

TABLE 4
Measurements (in mm) and indices of two specimens of *Rossia (Allorossia) tortugaensis,* n. sp.

Sta.	Tortugas	Tortugas
Sex	M	F
ML	41.0	84.0
MWI	63.5	88.0
HWI	83.0	93.0
FLI	66.0	71.0
FWI	129.0	130.0
Arms		
I	33.0	25.0
II	44.0	29.0
III	41.0	30.0
IV	38.0	28.0
DSs	1.6	0.4
DSt	0.4	...

Holotype. U. S. National Museum.

Type locality. Off Dry Tortugas, Florida in 372-375 fathoms.

Distribution. Known only from the southern approaches to Dry Tortugas, Florida.

Remarks. This species is very closely related to *R. bullisi* from which it differs in respect to the shape of the sessile suckers, the larger size of the tentacular suckers, and the peculiar structure of the spermatophores. The paratype, a female, seems to lie somewhere between these two in respect to the size of the tentacular suckers but otherwise belongs to *R. tortugaensis.* It is given the name *tortugaensis* for the locality from whence it was collected, Dry Tortugas, Florida.

Rossia (Austrorossia) antillensis Voss, 1955

Figs. 3a, b, c, d, e

Rossia (Austrorossia) antillensis Voss, 1955, p. 86.

Material. 1 female, ML 61.0 mm, OREGON Sta. 490.
1 male, ML 39.0 mm, OREGON Sta. 1006.
1 male, ML 50.0 mm, OREGON Sta. 1011.
1 female, ML 35.0 mm, OREGON Sta. 1012.
1 male, 2 females, ML 43.0-62.0 mm, OREGON Sta. 1009.

Description. The *mantle* is saccular, rounded posteriorly, with the dorso-median border slightly protruding. It is about two thirds as wide as long. The *fins* are large, oval, with the anterior lobe free. They are thick and fleshy, flabby in consistency. The *head* is large, wide, and bears prominent eyes which are very wide in diameter.

The *funnel* is stout, tubular, and free for half of its length. The funnel organ is a strongly developed inverted V with large ventral pads.

The *arms* are of medium length and stout. They are in the order 3.2.4.1 in 5 out of 8 specimens measured. The suckers of the sessile arms are arranged in 2 distinct rows and uncrowded. The suckers of the females are somewhat smaller than those of the males whose suckers are enlarged in the mid portion of the arms.

In the male the dorsal arms are *hectocotylized* in the following manner. Proximally there are about 6 pairs of small suckers. These are followed by about 6 pairs of enlarged suckers which are about twice the diameter of the basal ones. The distal suckers are abruptly much smaller. At the base of the third pair of suckers is a fleshy pad or fold on the outer or ventral margin of the arm. This peculiar pad extends to the base of the eighth pair of suckers and is similar on both arms.

The *tentacles* are short and stout and generally oval in cross section, but squared on the oral edge. The clubs are slightly over half of the mantle length and are rounded rather than expanded and twisted in a corkscrew fashion. A well developed swimming membrane borders the dorsal edge slightly below the suckers to within a millimeter from the distal end. The suckers are very

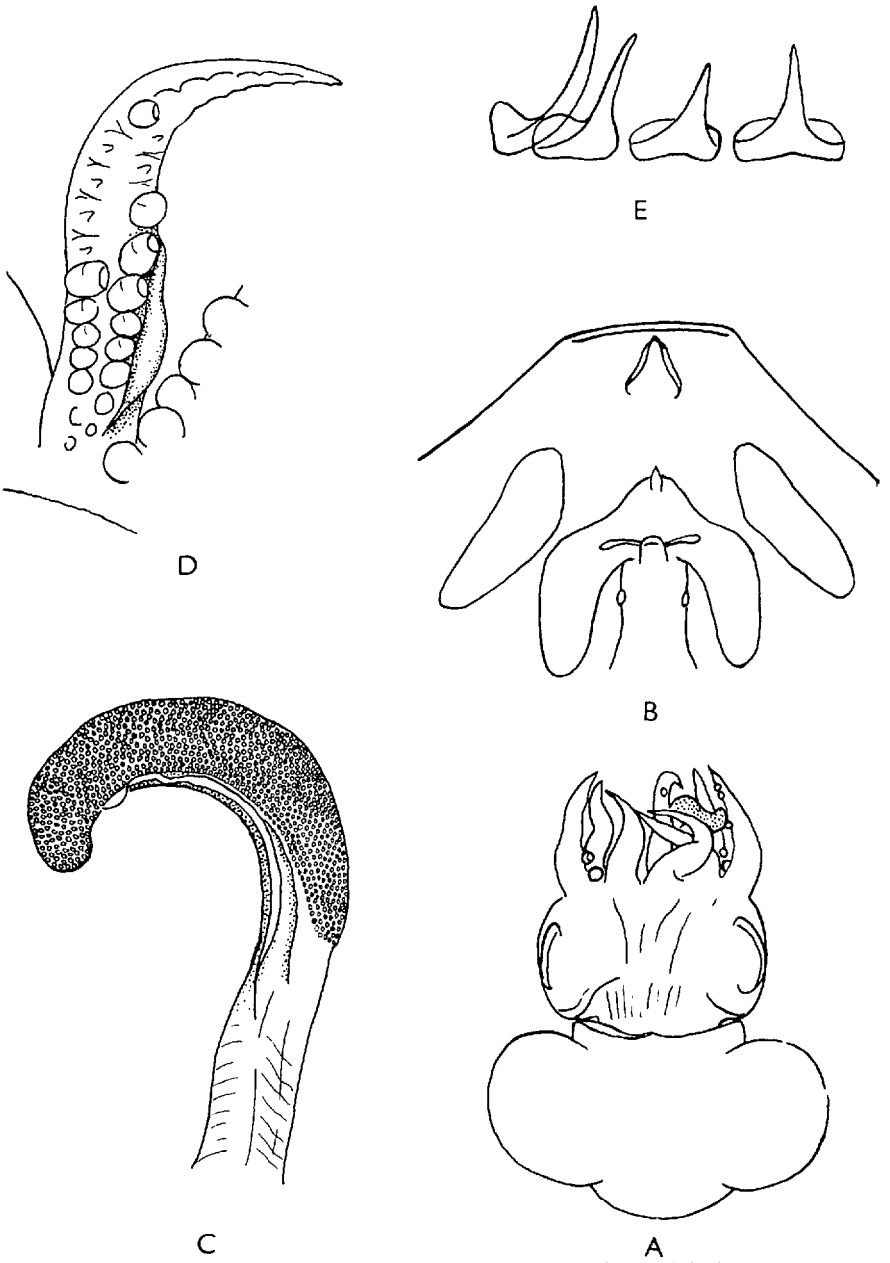

FIGURE 3. A-E. *Rossia antillensis* Voss. A. Dorsal view of holotype, mantle length 43.0 mm. B. Funnel organ. C. Tentacular club. D. Left dorsal arm. E. Radula. (From Voss, 1955).

minute, their total diameter about 0.15—0.2 mm with the aperture about 0.12 mm. There are about 30—40 rows of suckers.

The *color* is reddish purple with densely distributed chromatophores which extend onto both the dorsal and ventral surfaces of the fins, an unusual occurrence in the genus *Rossia*. The surface is smooth.

TABLE 5
Measurements (in mm) and indices of six specimens of *Rossia (Austrorossia) antillensis* Voss.

Sta.		490	1006	1011	1009	1009	1009
Sex		F	M	M	F	F	M
ML		61.0	39.0	50.0	62.0	59.0	43.0
MWl		72.0	80.0	70.0	68.0	63.0	67.0
HWI		67.0	87.0	74.0	71.0	71.0	75.0
FLI		78.5	62.0	70.0	74.0	70.0	72.0
FWI		152.0	148.0	132.0	145.0	139.0	144.0
Arms							
	I	37.0	34.0	38.0	45.0	38.0	33.0
	II	48.0	41.0	45.0	50.0	38.0	39.0
	III	52.0	42.0	49.0	55.0	51.0	44.0
	IV	36.0	37.0	45.0	45.0	43.0	33.0
DSs		2.3	2.5	3.0	2.5	2.3	2.5
DSt		0.2	0.15	....	....	....	....

Holotype. Museum of Comparative Zoology Cat. No. 203976.

Type locality. 280-300 fathoms off Sagua la Grande, Cuba. March 13, 1938. ATLANTIS Sta. 2987.

Distribution. North coast of Cuba to Dry Tortugas, Florida and northward to the latitude of Tampa, Florida.

Remarks. This is the largest species of *Rossia* found in our waters. From its distribution this species appears to be limited to the West Indian faunal region. Its northern boundary coincides with the northern limits of the West Indian faunal region, and further northward it is replaced by *Rossia bullisi*.

A few scattered patches of eggs taken at several stations by the OREGON seem to belong to this species. The eggs are much larger than those of any known species and compare favorably in size with those taken from the largest Cuban female.

Order TEUTHOIDEA
Suborder *MYOPSIDA*
Family PICKFORDIATEUTHIDAE
Genus *Pickfordiateuthis* Voss, 1953

Pickfordiateuthis pulchella Voss, 1953
Figs. 4a, b, c, d, e

Pickfordiateuthis pulchella Voss, 1953, p. 602.

Material. 1 male, 1 female, ML 13.5, 17.0 mm, from under a pier at Key West, Florida, November, 1949. Leg. Craig Phillips.

Description. The mantle is cylindrical, slightly swollen near the middle, and bluntly rounded posteriorly. The anterior margin is produced forward in the dorso-median line and emarginated beneath the funnel with acute lateral projections. The *head* is large, twice as broad as long, and somewhat flattened. The eyes are prominent and without an accessory lid or visible pore. The *fins* are large, round, about 50 per cent of the mantle length and attached dorsolaterally to the posterior part of the body. They are not united posteriorly.

The *arms* are strong, short, in the order 3.4.2.1 and have strong swimming membranes on the first and third pairs. The suckers are in two rows, barrel shaped, and with short pedicels inserted laterally. The chitinous rings are equipped dorsally with small blunt teeth, ventrally with 3 or 4 blunt teeth. All of the arm suckers are bordered by a thin protective membrane with supports.

The *tentacles* are long, stout, rounded dorsally and compressed ventrally, with compact clubs which are bordered dorsally by a swimming membrane. The suckers are in two rows on the hand part but in 4 rows distally. The sucker discs are equipped with small, even, pointed teeth. The chitinous rings are smooth.

The left ventral arm is *hectocotylized* in the male by the loss of the inner row of suckers on the distal fourth of the arm. These are replaced by a heavy, pad-like membrane into which the outer row of suckers are partially inserted.

The *gladius* is well developed, rather fragile and thin. The rhachis is narrow, highly keeled, and with thin delicate borders. The vane is about two thirds of the total length and very broad with strongly convex sides.

The *buccal membrane* is not lobed and has seven poorly developed supports. It is thick and fleshy, closely folded, and in the female bears a conspicuous, smooth, rounded spermatophore receptacle on the lower lip.

TABLE 6

Measurements (in mm) and indices of 2 paratypes of *Pickfordiateuthis pulchella* Voss from Key West, Florida

Sex	M	F
ML	13.5	17.0
MWI	45.0	44.0
HWI	46.6	...
FLI	51.8	50.0
FWI	85.0	96.0
Arms		
I	3.0	...
II	6.2	...
III	7.0	...
IV	6.8	...

Holotype. U. S. National Museum Cat. No. 574846.

Type locality. Old Rhodes Key, Florida, March 3, 1950, from 3 feet of water over a bed of *Thalassia.*

Distribution. This species is known only from the Florida Keys from Key West to Key Biscayne just south of Miami, Florida.

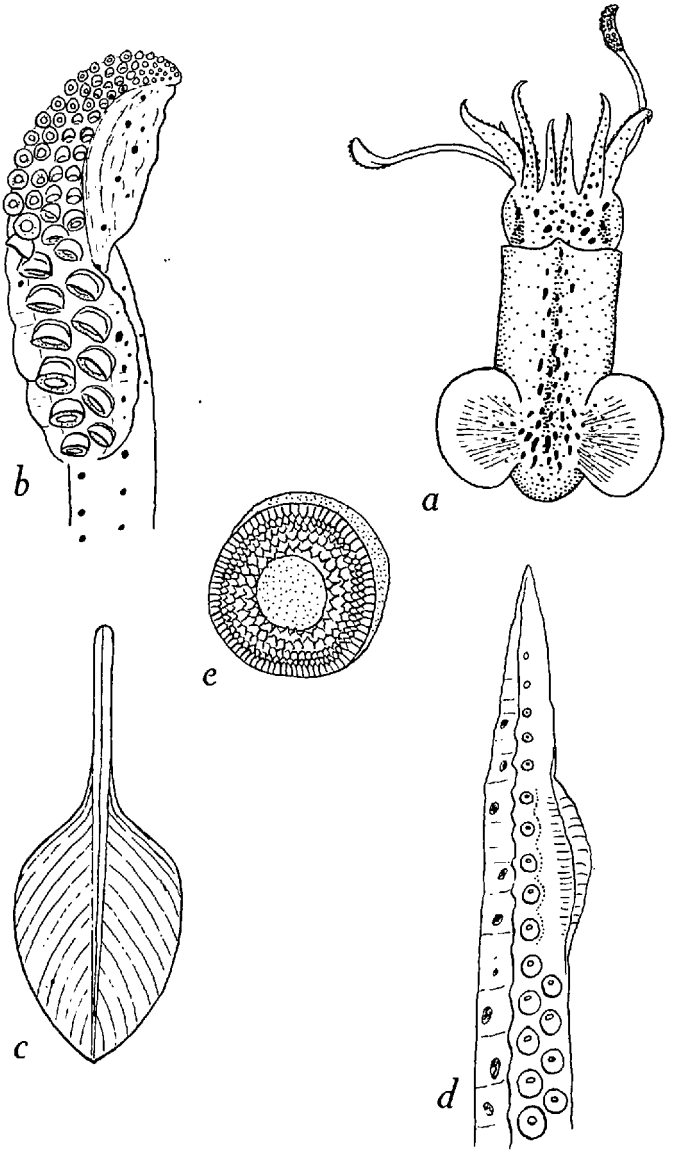

FIGURE 4. a-e. *Pickfordiateuthis pulchella* Voss. a. Dorsal view of holotype, mantle length 22.0 mm. b. Tentacular club. c. Gladius. d. Hectocotylized left ventral arm. e. Dorsal view of tentacular sucker.

Discussion. This remarkable little species is most certainly a member of the teuthoid myopsids and apparently closely related to the Loli-

ginidae. In a previous paper (1953) the author suggested that this genus might be a connecting link between the Sepioidea and the Myopsida, but this view can no longer be held.

Remarks. This is probably a rather common species of squid in the vicinity of the extensive flats of the marine grass *Thalassia testudinum.* Recently several more specimens have been taken from grass beds off Key Biscayne, Fla.

Family LOLIGINIDAE

Genus *Lolliguncula* Steenstrup, 1881

Lolliguncula brevis (Blainville, 1823)

Figs. 5 a,b,c

Loligo brevis Blainville, 1823, p. 133.
Loligo brevipinna Lesueur, 1824, p. 282.
Loligo hemiptera Howell, 1868, p. 239.
Lolliguncula brevis, Steenstrup, 1881, p. 242.

Material. 6 males, 8 females, ML 34.0-77.5 mm, from Apalachicola Bay, Florida, June, 1949. Leg. C. P. Idyll and R. M. Ingle.

1 male, 4 juv. ML 14.0-68.0 mm, OREGON Sta. 440.

1 male, 1 female, ML 31.0-43.0 mm, off Port Isabel, Texas, May 14, 1946. Leg. J. W. Hedgpeth.

1 male, ML 58.0 mm, off Freeport, Texas. Leg H. L. Whitten.

3 males, 1 female, ML 55.0-58.0 mm, 17 fathoms, 30 miles south of Port Aransas, Texas, May 12, 1951. Leg. H. H. Hildebrand.

1 male, 1 female, ML 39.0-67.0 mm, OREGON Sta. 150.

1 male, ML 72.0 mm, OREGON Sta. 187.

1 male, ML 82.0 mm, OREGON Sta. 149.

2 females, 5 juv. ML 32.0-46.0 mm, OREGON Sta. 638.

1 female, ML 77.0 mm, Cape San Blas, Florida, Sept. 31, 1950. Leg. R. M. Ingle.

7 males, 7 females, ML 43.0-71.0 mm, OREGON Sta. 426.

50 juv., ML 15.0-36.0 mm, OREGON Sta. 851.

5 females, 6 undet., ML 33.0-68.0 mm, OREGON Sta. 864.

3 females, ML 42.0-60.0 mm, ½ mile south of John Gorrie Bridge, Apalachicola Bay, Florida, 1954. Leg. D. R. Moore.

Description. The *mantle* is short, stout, cylindrical, and pointed posteriorly. The width is less than half of the length. The anterior mantle margin is produced in a blunt point in the dorso-median line. The *fins* are large, their length about half of the mantle length and together forming a slightly transversely elliptical circle. They are united posteriorly by a fleshy ridge which encircles the posterior end of the body. The head is small and compact with moderate eyes.

The *funnel* is short, stout, and free for about half of its length. The funnel organ is comprised of two curving, slightly separated members which posteriorly blend into the abductor muscle. The ventral pads are small, oval and compact, only slightly raised.

The *arms* are short and in the order 3.4.2.1, or sometimes 4.3.2.1. The dorsal pair is very short. The third pair of arms is bordered by a broad swimming membrane which extends the full length of the arms. The suckers are biserial with the chitinous rings armed with broad, bluntly rounded or truncated teeth on the distal margins but smooth on the proximal half.

The left ventral arm of the male is *hectocotylized* by the loss of the suckers of the distal ¼ of the outer or dorsal row and the extension of the pedicels into long, slender, fleshy papillae.

The *tentacles* are moderately long with slender, keeled stalks and large clubs which are surrounded by a strong protective membrane which extends back on the outer surface of the club for about 2/3 of its length. The suckers are arranged in 4 rows, those of the hand being conspicuously larger than the small suckers of the distal third. The hand bears 2 median rows of suckers bordered on either side by a row of suckers about 2/3 of the diameter of the median suckers. The chitinous rings bear small, equal sized pointed teeth which are longer on the distal side of the median suckers and the outer side of the marginal suckers.

The *gladius* has a short, narrow rhachis anterior to the blade which is large, wide and thin with rounded lateral margins forming an obtuse angle posteriorly. The surface of the blade is marked with thin diverging lines.

The *spermatophore pad* is a fleshy raised area on the inner surface of the mantle near the left gill. The spermatophores are attached to this pad in large numbers, nearly filling the left side of the mantle cavity.

The *color* in alcohol is yellowish with scattered but numerous large distinct reddish purple chromatophores nearly uniformly distributed over the dorsal and ventral surface of the mantle, head and arms with the exception of the ventral surface of the fins.

Holotype. Musée d'Histoire Naturelle, Paris.

Type locality. Brazil, probably near Rio de Janeiro.

TABLE 7

Measurements (in mm) and indices of 10 specimens of *Lolliguncula brevis* (Blainville) from off Apalachicola, Florida

Sex	F	M	F	M	M	M	F	F	F	F
ML	34.0	39.0	45.0	46.5	51.0	53.0	58.5	60.0	69.0	77.5
MWI	44.0	38.5	40.0	41.0	39.2	36.0	38.5	37.5	36.2	35.0
HWI	38.3	35.9	36.7	35.5	33.2	33.0	32.5	33.4	29.0	29.3
FLI	48.5	56.5	50.0	53.7	53.0	53.0	55.0	55.0	56.5	56.7
FWI	79.5	84.6	82.3	83.0	90.0	82.0	85.5	85.0	85.0	80.0
MAI	63.0	65.3	53.3	62.3	66.6	56.5	60.0	65.0	61.0	60.6

Distribution. Bermuda Islands; Atlantic coast of the United States from Maryland to Florida; Gulf of Mexico; Caribbean Sea; South America to Rio de la Plata.

Discussion. There seems to be a considerable degree of variation in the proportions of body length to fin length and fin breadth in this species over its entire range. In the Caribbean region and Brazil an insufficient number of individuals have come to hand for statistical studies. There also occur variations in the size and arrangement of the suckers and their dentition especially on the tentacular club.

In the upper Gulf of Mexico, *L. brevis* has much wider fins than elsewhere and may be typical of *L. hemiptera* Howell which belongs to this group. It is indeed possible that future study will reveal a trend through *brevis—brevipinna—hemiptera* in the variations of this species. The Brazilian forms seem almost identical to our northern Chesapeake Bay forms.

Remarks. This species has a far greater salinity tolerance than any other cephalopod which has been studied. The specimens from Apalachicola Bay were living in a salinity of about 17.0 ‰.

Genus *Loligo* Lamarck, 1798

Loligo pealei Lesueur, 1821
Figs. 5 d,e,f

Loligo pealei Lesueur, 1821, p. 92.
Loligo pealei, Verrill, 1882, p. 132.

Material. 1 male, ML 113.0 mm, OREGON Sta. 98.
1 female, ML 140.0 mm, OREGON Sta. 490.
1 male, ML 130.0 mm, OREGON Sta. 35.
1 male, ML 98.0 mm, OREGON Sta. 618.
1 female, ML 192.0 mm, OREGON Sta. 148.
1 female, ML 200.0 mm, OREGON Sta. 149.
1 male, 6 females, ML 79.0-121.0 mm, OREGON Sta. 407.
11 juv., ML 43.0-52.0 mm, OREGON Sta. 425.
5 juv., ML 41.0-67.0 mm, OREGON Sta. 313.
2 females, ML 74.0-95.0 mm, OREGON Sta. 328.

Description. The *mantle* is long, somewhat stout, cylindrical, pointed posteriorly, and its width is about 1/6 the length. The anterior margin is produced in a blunt point in the dorso-median line. The *fins* are large, united posteriorly by a fleshy ridge, and about 1/2 of the mantle length, the two fins together forming

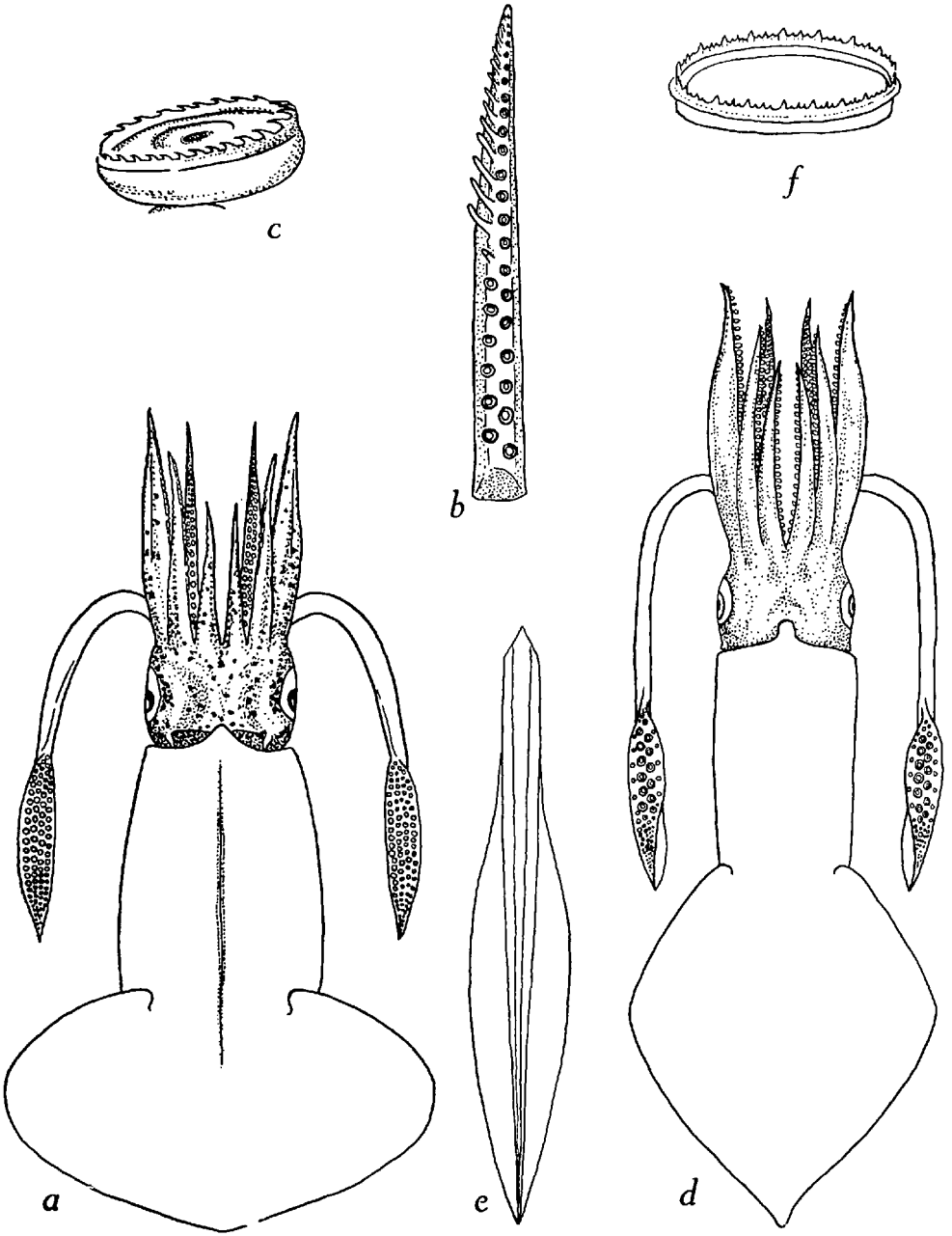

FIGURE 5. a-c. *Lolliguncula brevis* (Blainville). a. Dorsal view of female, mantle length 67.0 mm. b. Hectocotylized left ventral arm of male. c. Lateral view of tentacular sucker ring. d-f. *Loligo pealei* Lesueur. d. Dorsal view of male, mantle length 113.0 mm. e. Gladius. f. Lateral view of tentacular sucker ring.

a long rhombic figure. The *head* is small and compact with large eyes.

The *funnel* is stout and short and free for about half of its length. The funnel organ is shaped like an inverted V and is slender with large oval ventral pads.

The *arms* are moderately short and in the order 3.4.2.1. All of the arms are bordered by a thin protective membrane. The third pair of arms is equipped with a strong swimming membrane. The suckers are biserially arranged and equipped with chitinous rings armed with about 6 broad, truncated teeth on the outer margins of the proximal suckers. The rest of the margin is entire. In the distal suckers the teeth are long and sharp.

The left ventral arm of the male is *hectocotylized* by the decrease in size and partial loss of the suckers accompanied by a marked increase in the size of the pedicels. This starts at about the 20th pair of suckers and continues distad until near the tip where the suckers reappear. This modification is most marked in the outer row but is also found to a lesser extent in the inner row.

The *tentacles* are long and slender and are keeled along the outer edge. The clubs are large, bordered by a protective membrane, and with a swimming membrane on the distal third which is a continuation of the keel. The suckers are in 4 rows, the median rows about twice the diameter of the suckers of the marginal rows on the hand, all bearing small and uniform suckers in the distal part. The chitinous rings bear large pointed suckers of unequal size arranged as follows. Between each pair of large teeth is a single smaller tooth bordered on either side by a minute tooth. These sets of three teeth separate each of the larger teeth.

The *gladius* is thin and translucent with a moderately long rhachis and a broad vane with rather strongly curved lateral margins. The surface is marked with thin diverging lines.

The *spermatophore pad* of the female is a horse-shoe shaped organ or pad on the lower lobe of the buccal membrane.

The *color* in alcohol is yellowish with many small reddish purple chromatophores covering the dorsal surface of the mantle, head and arms. These are less numerous ventrally and completely lacking on the ventral surface of the fins.

Holotype. Academy of Natural Sciences of Philadelphia.

Type locality. South Carolina.

Distribution. New England to Florida; Gulf of Mexico; Central America to Venezuela.

Discussion. This is the common squid of the Atlantic coast of North America and is an important food and bait item. It has been thoroughly reported upon by Verrill (1882) but in its southern range has been repeatedly confused with *Doryteuthis brasiliensis* which differs from it chiefly in a slightly differing tentacular sucker dentition and in the shape of the gladius. This latter species is also probably recorded in the literature under the name of *Loligo gahi* which is a Pacific species.

Probably Verrill is guilty of first bringing *L. gahi* into the literature as occurring in the Gulf of Mexico, and this was carried on by Hoyle. In all probability the records refer to both *Doryteuthis plei*

and *D. brasiliensis*. The author has found no specimens of *L. pealei* which might be confused with *Lolliguncula brevis* as has been reported by other workers.

Genus *Sepioteuthis* Blainville, 1824

Sepioteuthis sepioidea (Blainville, 1823)
Fig. 6 a

Loligo sepioidea Blainville, 1823, p. 133.
Sepioteuthis bianguiata Rang, 1837, p. 73.
Sepioteuthis sepioidea, Orbigny, 1839, p. 34.
Sepioteuthis sloani Leach, 1849, p. 81.
Sepioteuthis ovata Gabb, 1868, p. 193.
Sepioteuthis ehrhardti Pfeffer, 1884, p. 63.
Sepioteuthis occidentalis Robson, 1926, p. 352.

Description. The *mantle* is subcylindrical and stout, tapering posteriorly, and bluntly rounded distally. The anterior mantle margin is produced dorsally into a blunt triangular point in the median region. The *fins* are long and occupy up to 90 to 97 per cent of the mantle length in the adults. They are united posteriorly by a fleshy ridge and together they form a long oval which is broadest in the middle. The *head* is large, flattened, wider than long and bears prominent eyes.

The *arms* are of moderate length, about 45 per cent of the mantle length, and in the order 3.4.2.1. The third and fourth pairs are subequal, the first pair very short. The arms are keeled, and the third arms are bordered their entire length by a broad swimming membrane with protective membranes bordering the suckers. The suckers are in two rows on the arms with their chitinous rings equipped with bluntly rounded equal teeth.

The left ventral arm of the male is *hectocotylized* for about 25 per cent of its length by the loss of the suckers of both rows distally and being replaced by large papillae. The right ventral arm is weakly modified by a similar loss of suckers, but the peduncles also disappear leaving the distal portion of the arms smooth.

The *tentacles* are moderately long, stout, keeled and with a large club. The suckers of the club are in 4 rows of which the two median rows bear the largest suckers. The suckers are equipped with chitinous rings bearing long, sharp, triangular teeth.

The *gladius* is large with a stout rhachis and a broad vane with thickened marginal borders.

Holotype. Musée d'Histoire Naturelle, Paris.

Type locality. Martinique.

Distribution. Bermuda; Bimini, Bahamas; Miami to Key West and Dry Tortugas, Florida; West Indies; Honduras.

Remarks. This is one of the most truly tropical squid in the Western Atlantic. It is found throughout the West Indies and northward along either side of the Florida Current, but it does not apparently enter the Gulf of Mexico proper. It has never been reported north of

Dry Tortugas on the western coast of Florida nor on the Mexican coast north of Campeche. Along the east coast of Florida it occurs as far as Cape Canaveral, the northern boundary of the Caribbean Province, but it is not known north of that point. Its occurrence in Bermuda is probably the result of the effect of the Gulf Stream. No specimens have come to hand from the Key West or Tortugas area, hence the description above is based upon individuals captured in the Miami area.

Genus *Doryteuthis* Naef, 1912

Doryteuthis plei (Blainville, 1823)
Figs. 6 b,c,d

Loligo plei Blainville, 1823, p. 132.
Doryteuthis plei, Naef, 1912, p. 742.
Doryteuthis plei, Adam, 1937.
Doryteuthis plei, Rees, 1950, p. 111.

Material. 5 males, 4 females, ML 54.0-214.0 mm, from shrimp hauls 32 miles northeast of Dry Tortugas, Florida, March 22, 1951.

Description. The *mantle* is long and very slender, cylindrical and pointed posteriorly. The mantle width is about 1/7 the mantle length in adults. The anterior mantle margin is produced in a prominent lobe in the dorso-median line. The *fins* are large, occupying about half of the mantle length in adults, and together form a long rhombic figure. They are united posteriorly in a fleshy ridge. The *head* is small with large eyes.

The *funnel* is short, stout, united with the head for about half of its length. The funnel organ is an inverted V shape, slender, and with large oval ventral pads.

The *arms* are short and in the order 3.4.2.1. The third arms are bordered by a broad swimming membrane which extends their full length. The suckers are biserially arranged and are equipped with chitinous rings armed with blunt, truncated teeth on the distal margins alone.

The left ventral arm of the male is *hectocotylized* by the distal 38.0 per cent of the suckers being decreased in number, minute, and on long fleshy pedicels.

The *tentacles* are long and slender with prominent keels. The clubs are surrounded by a protective membrane and carry a swimming membrane on the distal third of the dorsal margin. The suckers are in four rows of which those on the hand are markedly dissimilar in size while the distal ones are minute. The hand suckers in the median rows are about 3 times the diameter of the marginal suckers with the chitinous rings armed with about 29 to 41 subequal bluntly pointed, curving teeth sometimes with smaller ones interspersed.

The *gladius* is long and slender with a short rhachis and a long, slender, tapering vane with straight margins whose borders are thickened and slightly pigmented in a line parallel with the margin.

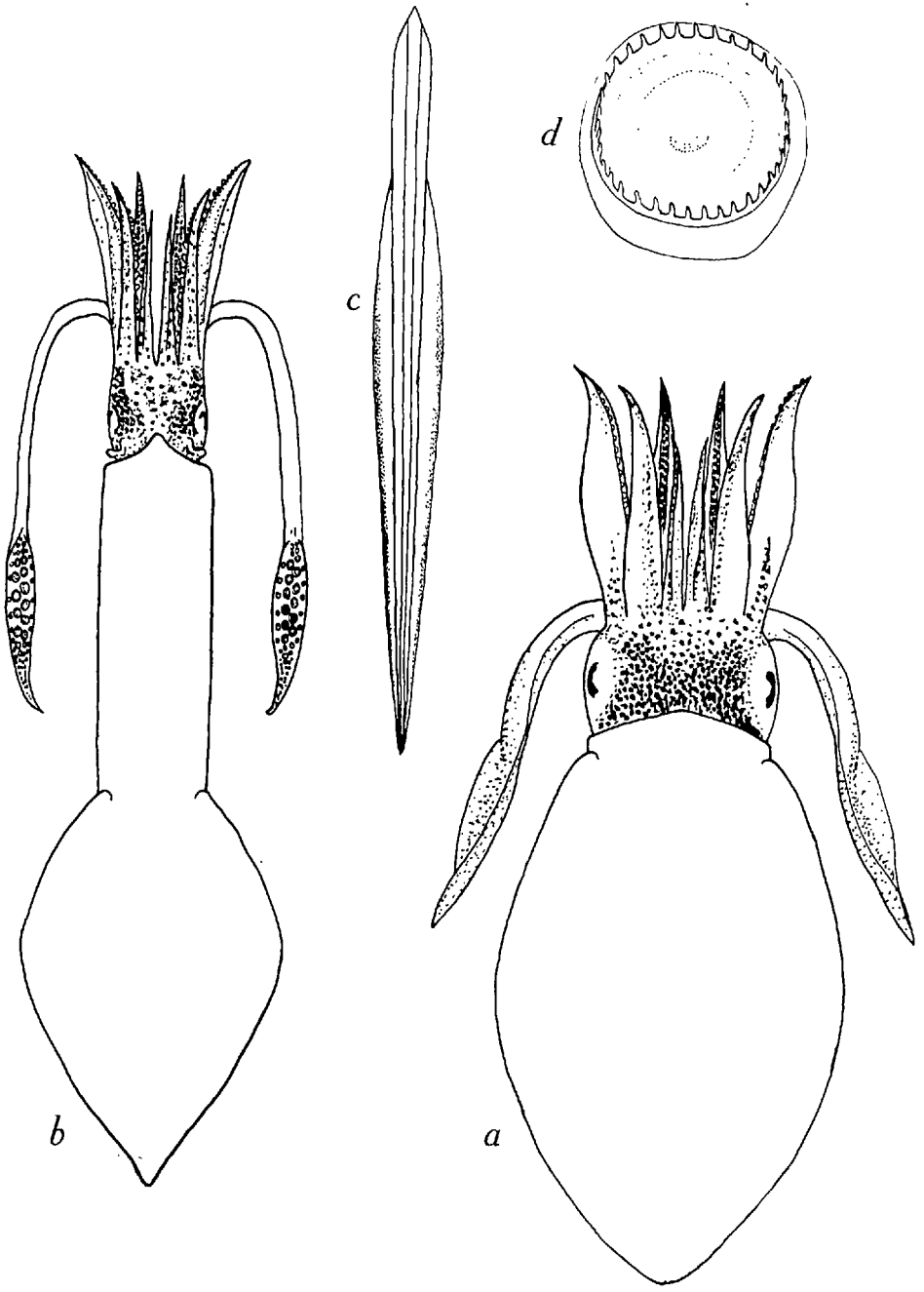

FIGURE 6. a. *Sepioteuthis sepioidea* (Blainville), dorsal view of female, mantle length 140.0 mm. b-d. *Doryteuthis plei* (Blainville). b. Dorsal view of male, mantle length 227.0 mm. c. Gladius. d. Dorsal view of tentacular sucker ring.

The *spermatophore pad* in the female consists of a large round protuberance on the lower lobe of the buccal membrane which is surrounded by radiating folds of the lobe.

The *color* in alcohol is light yellowish with small scattered reddish brown or yellow chromatophores dorsally which become very sparse ventrally. In the male the ventral surface of the mantle is covered with long irregular streaks of reddish brown, perhaps the most characteristic feature of the species.

TABLE 8
Measurements (in mm) and indices of 9 specimens of *Doryteuthis plei* (Blainville) from shrimp hauls off Dry Tortugas.

Sex	M	F	M	M	M	M	F	F	F
ML	214.0	178.0	171.0	125.0	120.0	74.0	66.0	56.0	54.0
MWI	15.4	17.4	17.0	19.2	20.8	23.2	25.8	25.0	23.2
HWI	11.7	15.2	15.8	16.0	17.5	17.6	20.5	21.9	22.2
FLI	54.0	50.5	49.0	47.2	48.0	43.3	45.5	39.3	35.2
FWI	36.0	38.8	39.1	41.5	37.5	37.8	47.0	40.2	37.0
MAI	31.2	36.0	36.8	36.0	51.5	44.6	41.0	40.2	26.0

Type. Musée d'Histoire Naturelle, Paris.

Type locality. Martinique.

Distribution. Brazil; Caribbean Sea; lower Gulf of Mexico; east coast of Florida to Sea Island, Georgia.

Remarks. This species was originally described by Blainville in 1823 and was beautifully pictured by Orbigny in 1835 and again in 1841 and 1848. Yet from that time until Adam rediscovered it in the MERCATOR collections in 1937 it remained unreported in the literature. It is a very common species in the West Indian region, and the author has examined specimens in the collections of the U.S. National Museum from as far north as Sea Island, Georgia. Its distribution along the Central American coast is not known. This seems to be a strictly tropical species and reaches a considerable size.

Suborder *OEGOPSIDA*
Family LYCOTEUTHIDAE
Genus *Lycoteuthis* Pfeffer, 1900

Lycoteuthis diadema (Chun, 1900)
Fig. 7 a

Enoploteuthis diadema Chun, 1900, p. 532.
Lycoteuthis diadema, Pfeffer, 1908, p. 294.
Lycoteuthis diadema, Pfeffer, 1912, p. 114.

Material. 1 female, ML 70.0 mm, OREGON Sta. 481.
1 female, ML 83.0 mm, OREGON Sta. 321.
1 female, ML 51.0 mm, OREGON Sta. 382.

Description. All of the above specimens were taken from the stomachs of either fish or sharks and thus were slightly to moderately damaged. For this reason the description given here is supplemented by that of Chun (1910) from the VALDIVIA specimens.

The *mantle* is moderately stout, cylindrical, and somewhat pointed posteriorly. The anterior mantle margin is slightly produced in the dorso-median line. The mantle width is about 1/3 of the mantle length. The *fins* are of moderate length but are very broad and triangular in shape and terminal in position. The *head* is small and compact with moderately large eyes which bear 5 round light organs on their ventral periphery.

The *funnel* is short and stout, free for about 1/3 of its length. The funnel organ is a broad inverted V with rounded lateral arms. The ventral pads are oval, thick and prominent.

The *arms* are in the order 2.3.4=1 with the dorsal and ventral pairs about equal in length and only slightly shorter than the laterals. The third pair of arms is bordered by a broad swimming membrane which extends the full length of the arms. The suckers are in two rows throughout and the ventral suckers are bordered by a slender protective membrane with strong supports. The suckers are small with narrow chitinous rings which bear numerous teeth of which those on the distal half are long, slender, sharp and curving while those of the proximal half are short and truncated.

The *tentacles* are moderately long and round in cross section. The tentacular club bears four rows of suckers which are large in the hand part but gradually decrease distally. The suckers bear about 8 or 9 long, slender, blunt teeth on the distal margin while the proximal margin is smooth.

The *light organs* in this species have been well described and figured by Chun (1910). Two are found embedded in each tentacular stalk, one near the base and one about midway of the stalk. Five large light organs are found on the ventral periphery of the eyeball of which the central one is of a different color and surface texture from the other 4. Within the mantle cavity 10 large light organs are distributed as follows: 2 within the funnel on either side of the anus; a line of 5 across the middle of the mantle cavity consisting of one near the base of each gill and 3, 2 large and one small median organ, horizontal to the midline; and 3 large light organs in a line across the mantle near the posterior end. In contrast to the previously mentioned organs, these 3 are attached to the inside of the mantle wall instead of the visceral mass.

The gladius is strongly built, the rhachis narrow anteriorly, broad in the mid-section and then tapering to the posterior quarter where it again broadens into a spoon-shaped conus at the posterior end.

TABLE 9

Measurements (in mm) and indices of 3 specimens of *Lycoteuthis diadema* (Chun) from the Gulf of Mexico

Sta.	481	321	382
Sex	F	F	F
ML	70.0	83.0	51.0
MWI	27.0	30.0	37.0
HWI	21.2	....	....
FLI	50.0	43.5	41.0
FWI	83.0	82.0	86.0
MAI	47.0	51.0	61.0

Holotype. Museum der Universität, Leipzig.
Type locality. South side of the Benguela Current, 31°21'S, 15°58'E.
Distribution. Benguela Current; Westwind Drift; west coast of South America; Gulf of Mexico.

Remarks. This beautiful squid is still to be counted amongst the rarest of the oegopsid squids. Most of the known specimens have been taken from the stomachs of deep water fish with the exception of Chun's specimens from the VALDIVIA. Apparently, no males of this species have ever been captured.

Genus *Oregoniateuthis,* n. gen.
With the characters of the type species.
Type species: *Oregoniateuthis springeri,* n. sp.

Oregoniateuthis springeri, n. sp.
Figs. 7 b,c,d,e,f

Holotype. Male, ML 80.0 mm, OREGON Sta. 382.

Description. This is a squid of moderate size having a total length of 207.5 mm, from the posterior end of the body to the tip of the longest sessile arm.

The *mantle* is slim, cylindrical, and tapering posteriorly to a long, sharply pointed, *Abralia*-like tail. The anterior median dorsal margin is lightly produced. The ventral margin is straight. The *fins* are wide, pointed laterally and terminating indistinctly posteriorly in a well defined ridge which extends to the distal end of the tail.

The *funnel* is small and compact. The mantle locking apparatus consists of a simple straight funnel member and a corresponding slightly raised ridge on the inner surface of the mantle.

The *head* has been slightly crushed, but it appears to be of moderate size with large eyes. The external cornea is widely open and semicircular, the posterior margin straight, the anterior margin rounded and with a clearly defined sinus. The head is connected with the mantle dorsally by a simple, straight nuchal locking cartilage.

The *arms,* with the exception of the second pair, are of moderate length and in the order 2.3=4.1. The first pair are the shortest with a slight ridge on the dorsal surface. The second pair is the longest and is longer than the mantle. The arms are rounded for most of their length but distally become flattened and broadened. The suckers are of moderate size and stalked, in 2 rows proximally, but at about ¼ of the length of the arm the upper row disappears followed at about 1/3 of the total length by the disappearance of the ventral row, after which they are replaced by small pointed papillae. The suckers are bordered by a narrow protective membrane dorsally with supports and by a broad membrane ventrally with prominent large supports. There are about 15 widely spaced round light organs embedded in the dermal layer, becoming somewhat crowded distally and terminating in a small light organ near the tip. The *arms* of the third pair are slightly longer than the first pair, broad and bordered laterally by a strong swimming membrane. The suckers are in 2 rows, toothed on the entire margin, and with a small protective membrane

dorsally and a larger one ventrally, both with prominent supports. Eight large light organs are present in the dorsal side of the arm, decreasing in size distally. The fourth arms are normal with a slight skin fold ventrally, and the suckers are protected by 2 low membranes with supports. The *tentacles* are missing, broken off just above the base of the arms.

The *eyes* are large and prominent and bear 5 large light organs of equal size on the ventral periphery. The middle organ is much darker than the others and has a purple sheen.

The *buccal membrane* is unpigmented with the exception of a few scattered chromatophores. It has 8 lappets and 8 supports attached dorsally to the arms. The oral surface is thickly covered with fleshy overlapping papillae.

The outer integument is missing over most of the mantle and the fins so that an accurate account of its pigmentation and the arrangement of the light organs is impossible except in the head region. The head bears 8 light organs: 1 large one in front of the eye on either side near the base of the third arms; 1 small light organ at the upper corner of the eyelid; a large one on the lower corner of the eyelid, and a pair of light organs, one on either side of the posterior part of the head.

On the mantle a few more can be located wherever the skin is present: 1 beneath each fin near the point of attachment and midway of the fin; 2 on either side just anterior to the fin; 1 on each side of the mantle near the anterior margin; 1 dorsally at the base of the fin near the anterior insertion; 1 in the dorso-median line at the posterior end of the fins; and a pair dorsally near the *midpoint* of the tail-like projection of the mantle. Doubtless if more of the skin were present an added number of light organs would be found.

Within the mantle cavity the photophores are distributed as follows. There are 2 large pinkish organs, one on either side of the rectum. Five light organs are distributed across the visceral mass at the base of the gills in the following manner: in the median area 3 photophores form a group, the median one round, the laterals oval and pointing slightly upwards towards the gill bases; a single round organ is born over the gill base itself. Just below the visceral mass is another series of 3 light organs, but these are attached to the inner wall of the mantle with the black reflectors facing the mantle cavity and the lenses attached at their periphery to the inner wall of the mantle in such a way that the light emitted would show through the wall which, when the animal is living, would be transparent.

TABLE 10

Measurements (in mm) and indices of the holotype of *Oregoniateuthis springeri*, n. sp.

Sex	M
ML	80.0
MWI	24.4
HWI	....
FLI	63.8
FWI	68.3
Arms	
I	32.0
II	94.0
III	37.5
IV	36.5
MAI	117.5

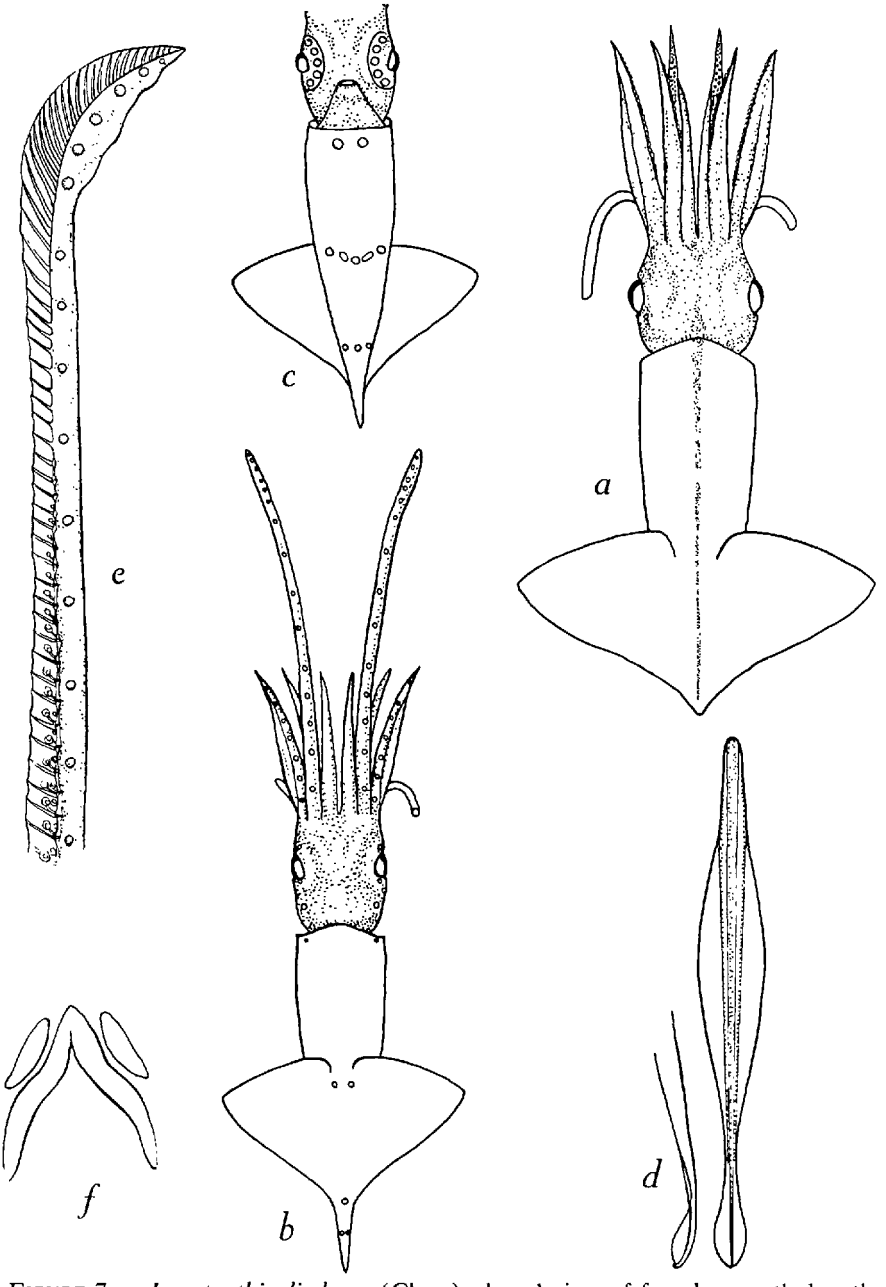

FIGURE 7. a. *Lycoteuthis diadema* (Chun), dorsal view of female, mantle length 70.0 mm. b-f. *Oregoniateuthis springeri,* n. sp. b. Dorsal view of holotype, mantle length 80.0 mm. c. Ventral view to show arrangement of internal light organs. d. Dorsal and lateral views of the gladius. e. Right dorso-lateral arm. f. Funnel organ.

Holotype. U. S. National Museum.
Type locality. OREGON Sta. 382, 29°11.5′N, 88°07.5′W, in 200 fathoms, June 21, 1951.
Discussion. Despite certain non-lycoteuthid characters such as the prolongation of the mantle, this species is placed without hesitation in the Lycoteuthidae. In the shape and adornment of the second arms, it recalls *Nematolampas regalis* Berry (1913) which has a similar modification of the third arms. Although the two species are very close, the present generic criteria employed in the teuthids would seem to require the erection of a new genus for this species. Further study of this family of 5 monotypic genera may indicate the need for a complete revision of the group based upon broader definitions.
Remarks. The generic name *Oregoniateuthis* has been given in recognition of the important work carried out by the U.S. Fish and Wildlife Service R/V OREGON in the Gulf of Mexico. The specific name *springeri* has been given in recognition of the many contributions to our knowledge of the marine life of the Gulf of Mexico made by Mr. Stewart Springer who was in charge of the OREGON operations during most of this period and to whom the author is deeply indebted for the privilege of studying the cephalopod collections.

Family ENOPLOTEUTHIDAE
Genus *Abralia* Gray, 1849

Abralia veranyi (Rüppell, 1844)
Fig. 8 a

Enoploteuthis veranyi Rüppell, 1844, fig. 2.
Abralia veranyi, Hoyle, 1886, p. 38.

Material. 1 male, ML 38.0 mm, OREGON Sta. 636.
1 male, 1 female, ML 34.0, 35.5 mm, OREGON Sta. 545.
1 damaged specimen, OREGON Sta. 546.

Description. The *mantle* is short and compact, tapering to a sharp point posteriorly, the width about 1/3 the length. The anterior margin is slightly produced in the dorso-median line. The *fins* are large and wide with the anterior edges free and rounded and the outer edges slightly concave. Posteriorly they taper to a long point and are united with the posterior end of the mantle. The *head* is moderately large with prominent eyes.

The *funnel* is short, stout, and free for about half of its length. The funnel organ is an inverted V, the dorsal member with fat posterior arms and the ventral pads stout.

The *arms* are of moderate length and in the order 2.4.1=3 with the second arms always the shortest. All of the arms with the exception of the ventrals are keeled and the third arms have well developed swimming membranes. The suckers are biserially arranged except for 4 rows of minute suckers at the distal tips. Proximally these suckers are transformed into hooks of which those on the dorso-lateral arms consist of about 9 pairs extending over about 4/5 of the arms. Distally these are replaced by suckers whose chitinous rings are smooth proximally but bear about 6—7 long blunt teeth distally. Beyond these suckers are 4 rows of minute suckers covering the tips of the arms.

The left ventral arm is *hectocotylized* by the absence of the large suckers distal to the hooks and the development of a pair of fleshy pads whose exact function is not known.

The *tentacles* are long and slender with rather well expanded clubs which are bordered dorsally on the distal half by a strong swimming membrane. The ventral rows of suckers are lost and the median ventral suckers are converted into long, slender, curving hooks of which the proximal is minute, the second the largest and the others decreasing in size distally. There are 4 rows of suckers at the tip of the club.

The *light organs* are numerous on the ventral surface of the mantle, head, arms and funnel. On the ventral surface of the head are about 3 rows of light organs with a row encircling the eyelids. The ventral arms have about 3 rows of light organs for most of their length. The third arms have a row of large scattered light organs on the swimming membrane. Five light organs are found on the ventral periphery of the eyeball of which the 2 end ones are much larger than the subequal median 3 and are somewhat oval in outline, the posterior one often with a dorsal sinus.

The ventral surface of the body is liberally covered with small light organs of two types, one slightly larger than the other. Often there is a narrow clear band on the ventral mid line. This clear band has been used as a diagnostic character by some workers, but its presence seems to be variable even within the same species. In some cases this clear strip seems to be due to the action of the preserving fluid.

Holotype. Not traced.

Type locality. Messina, Italy.

Distribution. Mediterranean; Bay of Funchal, Madeira; Cockburntown, San Salvador; west coast of Africa; Cuba; Gulf of Mexico.

Genus *Abraliopsis* Joubin, 1896

Abraliopsis sp.

Material. 1 female, OREGON Sta. 127.

Description. While this specimen is quite definitely an *Abraliopsis*, it is in such a poor state of preservation that it is impossible to assign it to a species with certainty. The buccal membrane is a deep violet as in *A. morissi*. There are about 5 rows of light organs on the ventral surface of the head and 2 rows on the ventral arms. The left ventral arm bears only the proximal black, bead-like light organ at the distal tip although the cavity of the middle organ is still present, and the tip itself is torn away. Most of the other characters are missing. The specimen came from the stomach of a deep water fish.

Family OCTOPODOTEUTHIDAE
Genus *Octopodoteuthopsis* Pfeffer, 1912

Octopodoteuthopsis megaptera (Verrill, 1885)
Fig. 8 b

Ancistrocheirus megaptera Verrill, 1885, p. 399.
Octopodoteuthopsis megaptera, Pfeffer, 1912, p. 223.

Material. 1 female, ML 41.0 mm, OREGON Sta. 796.

Description. The *mantle* is short and cylindrical, widest anteriorly and apparently with smooth margins tapering regularly to a narrow, blunt point. The *fins* are large and wide, covering almost the entire dorsal surface of the mantle, and fused together in the median line with the appearance of a single fin. Anteriorly there is a U-shaped notch at the junction of mantle and fins and a much smaller one posteriorly. The posterior end of the mantle projects beyond the fins for a short distance. Whereas the fins are stout and muscular, the mantle is soft and choroidal. The *head* is badly damaged, but the eyes are large, the right eyeball having a diameter of 11.0 mm.

The *funnel* is small and tubular, free for about half of its length, and attached by a dorsal bridle. The funnel organ is unusual. The dorsal member is an inverted V with full rounded lateral arms. Anteriorly at the shoulder, the pad is raised on either side in the manner of the mantle locking cartilage, and the ventral pads have corresponding grooves to accommodate this ridge.

The *arms* are of moderate length, stout, round, and becoming sharply attenuated and thread-like distally. Since the arms are mostly imperfect, it is difficult to determine accurately the arm formula, but it appears to be 1.2.3.4, the first pair distinctly the longest. The suckers are all modified into hooks which are high, slender and curving, and in the preserved specimen completely covered by a fleshy sheath. They are very widely spaced, few, and arranged in 2 rows.

The *tentacles* are missing and not even their bases could be found.

The present specimen has 3 pairs of *light organs*: 1 pair within the mantle cavity and the other 2 pairs deeply buried in the soft, thick, outer integument. A single small light organ lies posterior to each eyelid, deeply buried in the

TABLE 11

Measurements (in mm) and indices of a specimen of *Octopodoteuthopsis megaptera* (Verrill) from the Gulf of Mexico.

Sex	?
Sta.	796
ML	41.0
MWI	30.0
HWI	....
FLI	71.0
FWI	112.0
MAI	52.0
Arms	
I	20.0
II	21.5
III	18.0
IV	15.0

soft tissue, and a small, round light organ lies on the dorsal surface of each part of the paired *musculi recti abdominalis*. Neither of these latter organs is visible unless the muscle is lifted and turned over. The last pair of light organs is found on the ventral surface of the mantle about 1/5 of the length of the fin from the posterior edge. They are small, round organs broadly spaced on either side of the mid-ventral line. Whether these 6 bodies are actually light organs has not as yet been proved, but their remarkable similarity to such makes any other designation seem doubtful. Adam (1952) has described only the ocular and abdominal organs for *Octopoteuthis sicula* so that it is assumed that the posterior pair is characteristic of *Octopodoteuthopsis megaptera,* although nowhere described by Verrill.

In alcohol the specimen is soft and flabby, and the mantle and parts of the fins are covered by a thin skin which bears reddish chromatophores which are not crowded and give no more than a hint of color.

Holotype. No longer extant in the U. S. National Museum.

Type locality. 39°12′17″N, 72°03′30″W, 707 fathoms.

Distribution. Northern, eastern and western Atlantic; Florida Current off Miami, Florida; Gulf of Mexico.

Discussion. Adam (1952) has suggested that this genus and *Octopoteuthis* may be identical since they are only separated by the structure of the hooks on the sessile arms. The quite different shape of the fins and the presence of additional light organs seems to overweigh the former characters. In the author's opinion they seem to be two very distinct genera.

Family ONYCHOTEUTHIDAE

Genus *Onychia* Lesueur, 1821

Onychia caribaea Lesueur, 1821

Figs. 8 c,d

Onykia carribaea Lesueur, 1821, p. 98.
Teleoteuthis (Onychia) agilis Verrill, 1885, p. 400.

Material. 1 specimen, ML 11.5 mm, OREGON Sta. 1038.

Description. This is the only specimen of this species from the Gulf of Mexico to come to hand. It is a juvenile, and the measurements are given in the table. This species, generally considered common throughout the West Indies, apparently is rather difficult to obtain for only three specimens have been seen by the author. The description given here is based upon an adult collected by Mr. Jack Schmidt of Lake Worth, Florida.

The *mantle* is short and muscular with the anterior edge slightly produced in the dorso-median line and emarginated beneath the funnel. The *fins* are small and terminal with their anterior margin free and united posteriorly. The *head* is about as broad as the mantle with prominent eyes whose lids are round but truncated posteriorly with a strong sinus in the anterior margin. The *funnel* is well developed, deeply set into the ventral surface of the head, and supported by a ventral and a dorsal pair of supports.

The *arms* are long and in the order 4.3.2.1 with the first pair much the

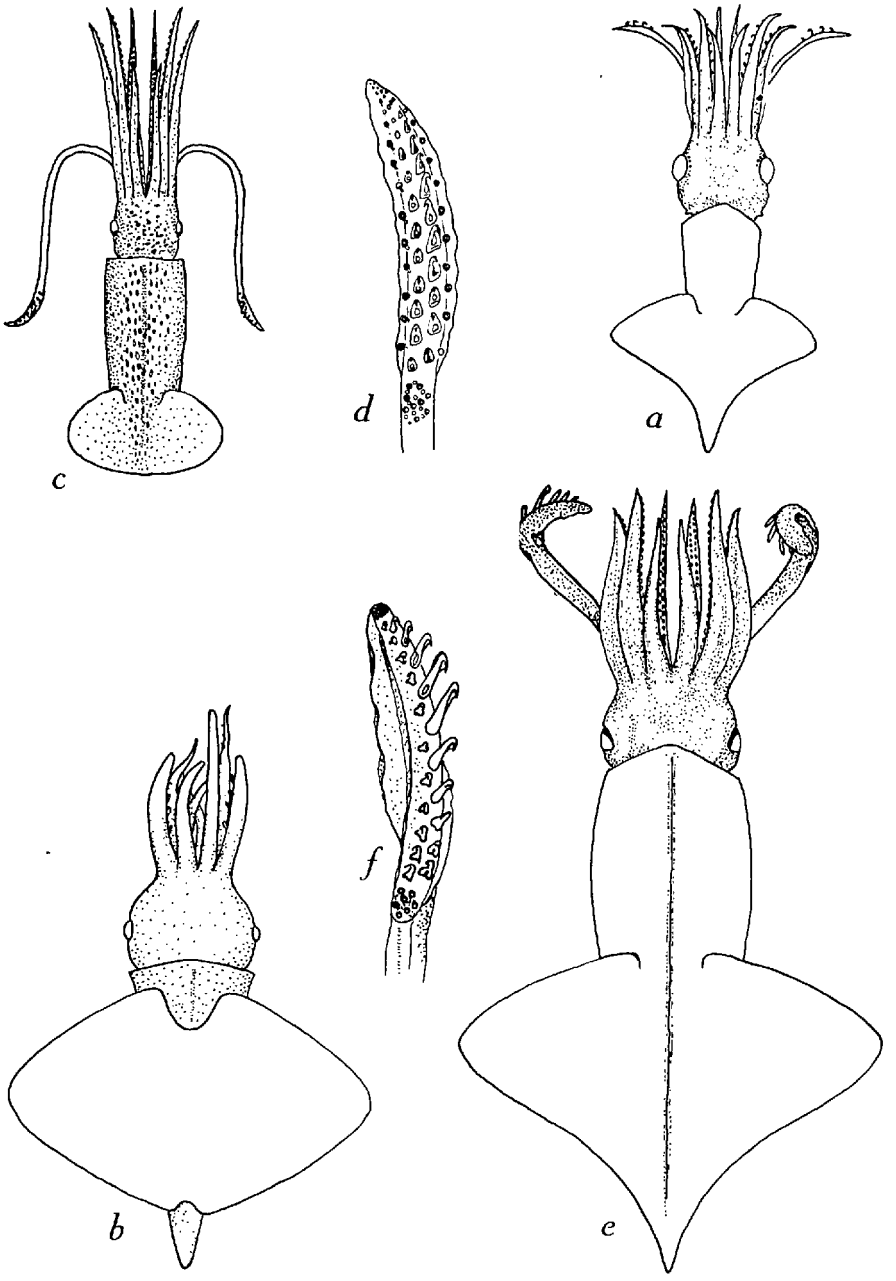

FIGURE 8. a. *Abralia veranyi* (Rüppell), dorsal view of male, mantle length 38.0 mm. b. *Octopodoteuthopsis megaptera* (Verrill), dorsal view of female, mantle length 41.0 mm. c-d. *Onychia caribaea* Lesueur. c. Dorsal view, mantle length 29.0 mm. d. Tentacular club. e-f. *Onychoteuthis banksi* (Leach). e. Dorsal view of male, mantle length 81.0 mm. f. Tentacular club.

shortest. The suckers are arranged in 2 rows and have smooth chitinous rings.

The *tentacles* are short and stout with the hand a little wider than the stalk. The club is equipped with 4 rows of suckers of which the inner 2 rows are transformed into sharply recurved hooks. The hooks and suckers decrease gradually in size distally. The carpal pad consists of about 11 suckers and 11 cups arranged in diagonal rows across the carpus.

The *color* of this species is very characteristic in the young as the entire dorsal surface of the mantle and head is covered with large red and brown chromatophores. In the adult the chromatophores are much smaller and more evenly distributed, but at all times a distinct dark streak is to be found in the dorso-median line. The young are much stouter than the adults, the body less pointed and the arms subequal in length.

TABLE 12

Measurements (in mm) and indices of a juvenile specimen of *Onychia caribaea* Lesueur.

Sex	?
Sta.	1038
ML	11.5
MWI	52.0
HWI	49.5
FLI	35.0
FWI	80.0
Arms	
I	7.5
II	9.1
III	9.0
IV	8.5
DSs	0.25
DSt	0.3

Holotype. Philadelphia Academy of Natural Sciences?

Type locality. Not traced.

Distribution. Worldwide in tropical and temperate seas.

Discussion. Pfeffer (1912) states that *O. caribaea* is restricted to the Atlantic and lists 4 species of the genus: *caribaea, intermedia, agilis* and *appellöfi.* A reexamination of the type of *Teleoteuthis agilis* Verrill revealed that the specimen is in excellent condition and undoubtedly belongs to Lesueur's *O. caribaea.* As Pfeffer pointed out, there is a discrepancy in the mantle length which evidently is a typographical error, and the measurement should read 36 mm instead of 46 mm as the measurement now is 35 mm after some shrinkage.

In all of the characters, the specimen resembles *O. caribaea.* Pfeffer states that according to the original drawing (Pl. 42, figs. 2-2a) the tentacular club is equipped with marginal suckers which are smaller than the carpal suckers. However, an examination of the

club itself shows that the marginal suckers are actually larger than the carpal suckers in the same manner as in *O. caribaea*. Also, in contrast to the drawing, the largest hooks of the club are the 6th through the 8th and not the 4th as Pfeffer concludes. Another difference established by Pfeffer from the drawing is that *agilis* has only 6-8 suckers in the carpal cluster as compared with about 9 in *caribaea*. Actually, Verrill's specimen has 9 suckers on the carpal clusters.

Genus *Onychoteuthis* Lichtenstein, 1818

Onychoteuthis banksi (Leach, 1817)
Figs. 8 e,f

Loligo banksii Leach, 1817, p. 141.
Onychoteuthis banksii, Orbigny, 1826, p. 61.

Material. 1 indet. ML 48.0 mm, OREGON Sta. 1038.
1 female, ML 70.5 mm, OREGON Sta. 1070.
1 male, 1 female, ML 81.0, 89.0 mm, OREGON Sta. 1088.

Description. The *mantle* is cylindrical, little less than 1/3 of the mantle length in width, and tapering posteriorly from the middle to a rather sharp point. The dorsal anterior margin is angled and the ventral margin is slightly concave. The *gladius* distinctly shows through the mantle in the mid-line. The *fins* are rhombic, large and wide, and broadest in the anterior portion, tapering to a point and united posteriorly. The *head* is small with small eyes, and the eyelid has a distinct sinus in the anterior edge. There are about 6—7 nuchal folds on either side of the median line.

The *funnel* is stout and compact and deeply set in the ventral side of the head. It is attached for about 1/3 of its length, being fastened to the head by a pair of dorsal bridles. The funnel organ is an inverted V with broad ventral pads. The mantle-funnel locking apparatus is a simple groove with a corresponding ridge.

The *arms* are of moderate length and in the order 4.3.2.1. All of the arms are equipped with more or less well developed swimming membranes, especially the 3rd pair of arms which has a broad and strongly developed swimming membrane along the entire length of each arm. The suckers of the sessile arms are biserially arranged and have round apertures which are devoid of teeth on the borders.

The *tentacles* are short and stout. The tentacular stalks are equipped with slender swimming membranes on the outer surface of the base which extend to slightly beyond the beginning of the tentacular club. The club is expanded and bordered by a strong swimming membrane on the dorsal margin. Proximal to the club is a small, round cluster of about 6 suckers with a corresponding number of carpal knobs. The entire carpal cluster is surrounded by a fleshy ridge. The club bears 2 rows of hooks of which the dorsal row is the smallest. The ventral hooks are long and slender, the 6th and 7th much the longest. Distally there are about 13 small suckers grouped in a compact mass at the end.

Within the mantle cavity are 2 round *light organs.* The largest one is embedded in the ventral surface of the ink sac; the smaller one is embedded just above the anus and slightly proximal to the opening.

The *color* in alcohol is yellowish with a few rather widely scattered reddish brown chromatophores which are more numerous dorsally. Usually there are numerous golden chromatophores over each eye. The gladius shows through the mid-line as a dark brown streak just beneath the surface.

TABLE 13

Measurements (in mm) and indices of 4 specimens of *Onychoteuthis banksi* (Leach) from the Gulf of Mexico.

Sta.	1038	1070	1088	1088
Sex	?	F	M	F
ML	48.0	70.5	81.0	89.0
MWI	29.2	29.0	26.0	26.0
HWI	28.2	25.0	21.0	....
FLI	57.3	59.5	63.0	54.0
FWI	81.5	78.7	80.0	81.0
MAI	40.5	41.2	42.0	36.0

Holotype. British Museum?

Type locality. Not traced.

Distribution. Cosmopolitan in warm and temperate seas. It has been reported from as far north as Hammerfest, Norway and as far south as Cape Horn.

Remarks. This is one of the most truly cosmopolitan of all of the squids. It is oceanic in habitat and is a strong and vigorous swimmer. Orbigny, in 1848, listed it from the Gulf of Mexico and stated that it lived in "fucus" or, as he probably meant, *Sargassum.*

Genus *Ancistroteuthis* Gray, 1849

Ancistroteuthis lichtensteini (Orbigny, 1839)

Fig. 13a

Onychoteuthis lichtensteini Orbigny, 1839, p. 334.
Ancistroteuthis lichtensteini, Gray, 1849, p. 55.
Ancistroteuthis lichtensteini, Pfeffer, 1912, p. 92.

Material. 1 female, ML 61.0 mm, OREGON Sta. 1305.

Description. The *mantle* is long and slender, muscular, with a short point posteriorly. The anterior margin is slightly produced in the mid-dorsal line and deeply emarginated beneath the funnel. The *head* is the same width as the mantle with moderate eyes, the eyelids with a deep anterior sinus. There are three folds below the eye on either side.

The *fins* are about half the mantle length, rhombic in outline and united posteriorly. The anterior lobe is free and the anterior margin slightly convex, the posterior margin slightly concave.

The *funnel* is strong, the head deeply excavated to contain it. The funnel

valve is wide and strong. The funnel organ is an inverted V, the anterior 1/3 with a strong V shaped carina, the ventral pads thick, fleshy and broadly oval. The mantle locking apparatus consists of a deep longitudinal groove in the funnel member with a corresponding long, slender, longitudinal ridge on the mantle.

The *arms* are long, slender, and in the order 2.3.4.1. Only the 3rd arms are keeled and equipped with a well-developed swimming membrane. The suckers are in 2 rows throughout, with wide apertures which have smooth chitinous rings. The suckers are bordered on either side by narrow protective membranes with strong supports.

The *tentacles* are long, triangular, flattened on their oral surfaces and equipped with a strong swimming membrane on the outer surface. The tentacular clubs are expanded, bordered dorsally by a swimming membrane which occupies about the distal 2/3 of the club and ventrally bordered by a swimming membrane which borders the entire club, having its origin about midway of the carpal cluster of adhesive buttons and cups. The hand part bears 2 rows of hooks arranged in 14 pairs, those of the ventral row being the largest and narrower than those of the dorsal row, the 6th-9th hooks in the ventral row being the largest. Distally there is a small cluster of suckers bearing minute teeth on their chitinous rings. These small suckers are arranged in 4 rows and number about 11. The carpal cluster is well defined, bordered, at least anteriorly, by a raised ridge, and comprises, in the present specimen, of 9 cups and 10 buttons on the left tentacle and 10 cups and 9 buttons on the right tentacle.

The surface of the head, arms, fins and mantle is covered with densely crowded, small purplish red chromatophores. These are lacking on the funnel and on the margins of the fins. The entire animal is glazed with a mother-of-pearl sheen with high-lights of gold and silver. Freshly caught specimens must be among the most beautifully colored of all the squids.

TABLE 14

Measurements (in mm) and indices of a female of *Ancistroteuthis lichtensteini* (Orbigny) from the Gulf of Mexico.

Sta.	1305	Arms	Right	Left
ML	61.0	I	42.5	41.0
MWI	26.2	II	52.0	54.0
HWI	26.2	III	50.0	50.0
FLI	49.2	IV	49.0	51.0
FWI	63.3			

Holotype. Musée d'Histoire Naturelle, Paris?

Type locality. Nizza, Italy (from fishmarket).

Distribution. According to Pfeffer it is known only from the Mediterranean Sea where it has been recorded from Nizza, Corsica, Messina, and Sicily.

Discussion. This is a small specimen, evidently still a juvenile. Pfeffer (1912) shows a large specimen, about 146.0 mm in mantle length, which has a long drawn out tail and fins (Taf. 9, Fig. 1), and he states that this is normal for the species. On the same plate, Fig. 5, he shows the fins and posterior end of the mantle of a specimen of

67.0 mm mantle length which corresponds very closely to our specimen. On the same plate, Figs. 2 and 3, he shows numerous neck folds as typical of the species and so states in the text, giving 6-7 fold on either side, but he adds that Orbigny and Verany do not show neck folds in their illustrations, so that presumably this varies within the species. The present specimen has no neck folds in evidence. Nonetheless, the specimen is placed in this species without hesitation and is the first recorded from the Western Atlantic.

Family PHOLIDOTEUTHIDAE
Genus *Pholidoteuthis* Adam, 1950

Pholidoteuthis adami, n. sp.
Figs. 9 a-h

Holotype. 1 female, ML 175.0 mm, OREGON Sta. 382.
Paratypes. 9 females, 1 male, ML 159.0-222.0 mm, OREGON Sta. 382.
1 female, ML 160.0 mm, OREGON Sta. 640.

Additional material.
1 indet. ML 146.0 mm, OREGON Sta. 549.
13 females, ML 176.0-276.0 mm, OREGON Sta. 481.
5 females, ML 200.0-305.0 mm, OREGON Sta. 81.

Description. The *mantle* is thick and soft, choroidal. It is broadest anteriorly but tapers soon thereafter into a long, attenuated tail. The anterior dorsal margin is slightly produced while the ventral margin is emarginated in a gentle curve below the funnel. The *head* is narrower than the mantle width, but in all 31 specimens the head is so damaged as to make an accurate description impossible. The eyes, however, are large and not projecting and apparently sunken deeply into the head.

The *fins* are large, occupying about 3/4 to 4/5 of the mantle length, and they are quite broad. They are in general sagittate in appearance and broadest in the anterior 1/3. The posterior margins are slightly concave with the posterior end drawn out into a very slender point and united at the posterior end of the body by a raised ridge. The anterior margins are slightly convex, and the anterior lobe is free.

The *funnel* is fairly large but weak. The funnel locking apparatus is a slightly sinuous, simple groove with the corresponding mantle organ a weak ridge. The funnel organ is an inverted V with broadly oval ventral pads.

The *arms* are long and stout at their bases but become attenuated distally. They are very fragile and easily separated from the body. There are indications of a swimming membrane or ridge on the third arms in some specimens, but this is lacking in others. In general the arm order is 2.3=4.1 or 2.3.4.1. The suckers are in 2 rows on the arms and born on slender pedicels. The bases are raised above the surface of the arm and the pedicels are mounted on these bases. The suckers are round, obliquely mounted, with wide apertures which have oblique chitinous rings. The basal suckers of the arms are equipped

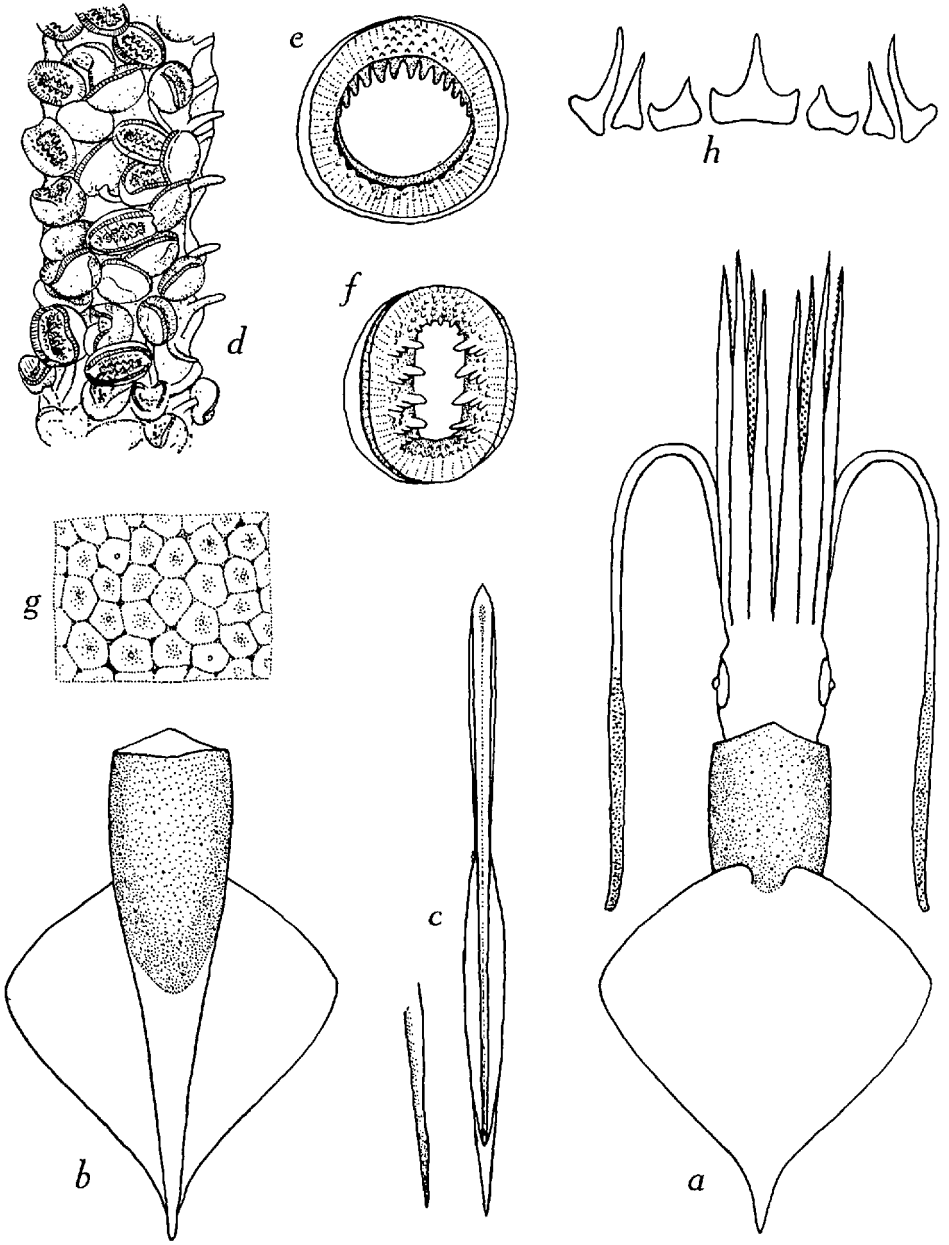

FIGURE 9. a-h. *Pholidoteuthis adami,* n. sp. a. Dorsal view of female, mantle length 136.0 mm. b. Ventral view of mantle. c. Gladius. d. Greatly enlarged section of tentacular club. e. Arm sucker. f. Tentacular sucker. g. Enlarged section of skin to show scales. h. Radula.

with a series of small, sharp, triangular teeth on the distal margins but smooth on the proximal part. The suckers of the mid-portion of the arm and distally are equipped with sharp triangular teeth largest proximally and found all along the margin.

The *tentacles* are long and slender, somewhat flattened, with an oral groove. The clubs are very long and only a little expanded. They are bordered for about 80 per cent distally by a very delicate membrane on either side which is transparent and strengthened by large fleshy supports. The suckers are in 4 rows, the first 5 or 6 pairs in alternate pairs on either side of the mid-line. All of them are rather far apart and scattered except distally where they form a compact patch of 4 rows. All of the suckers are a very dark chocolate brown due to the color of the chitinous rings. The suckers have large apertures which, however, are folded on a definite axis so that the apertures are nearly closed in most specimens. As a result the dentition has a very peculiar formation. The horny ring is wide, papillated on its inner 1/2, the outer edge finely crenulated. The papillae consist of blunt or sharp teeth pointed inward. On the lateral inner margins are about 4 long, blunt teeth backed up by about 2 rows of about 4 more. In the distal end of the oval aperture are about 4—5 rows of smaller, more slender, teeth which are sharply pointed with those of the inner row the longest. Proximally are 2 rows of small teeth pointed more or less upward from the general surface. In the distal minute suckers the dentition is more regular. All of the suckers are on long slender pedicels. In what would correspond to the carpal area are found two evenly toothed suckers which are widely spaced, and distal of these a single low pad is found.

The surface of the arms, head and fins are completely devoid of any pigmentation or sculpture except for a few small weak chromatophores around the base of the arms. The mantle, however, is covered by a thin, delicate skin of closely set scale-like plates which, in general, are roughly pentagonal in outline and tightly pressed together. These scales give the surface a roughened appearance, and this surface is colored a pale vinous red sprinkled sparsely with small darker chromatophores of dark brown which are on the underlying surface. Dorsally this sculptured skin forms a somewhat heart-shaped pattern

TABLE 15

Measurements (in mm) and indices of 8 specimens of *Pholidoteuthis adami*, n. sp. from the Gulf of Mexico.

Sta.	382	382	382	382	382	382	382	382
Sex	F	M	F	F	F	F	F	
ML	175.0	179.0	190.0	200.0	163.0	162.0	159.0	207.0
MWI	19.8	19.5	....	21.4	18.4	....	23.2	20.8
HLI	22.6	22.8	17.9	19.0	21.2	21.0	25.0	18.9
HWI	15.3	16.2	20.0	21.4	19.6	23.4	21.2	15.9
FLI	70.7	70.5	72.0	71.0	75.0	75.5	73.5	74.0
FWI	63.5	58.0	60.0	64.5	63.0	66.0	61.0	69.5
Arms								
I	119.0	108.0	86.0	134.0	72.0	120.0	81.0	121.0
II	105.0	100.0	133.0	152.0	116.0	107.0	112.0	137.0
III	125.0	108.0	114.0	133.0	108.0	115.0	119.0	136.0
IV	123.0	115.0	136.0	147.0	113.0	116.0	95.0	132.0
DSs	1.2	1.1	1.4	1.5	1.1	1.0	1.0	1.5
DSt	....	1.1	1.4	1.4	1.0	1.3	....	....
MAI	70.7	71.0	71.0	73.5	71.5	71.6	79.5	69.2

between the dorsal origin of the fins and ceases in a distinct line of demarcation. Ventrally the sculptured surface ends about midway of the length of the fins in a somewhat ovoid line drawn from the anterior origins of the fins downwards to a rounded point.

The *gladius* is long and slender, straight edged with an expanded vane area ending in a long slender pointed conus.

The beaks are sharp and heavily pigmented. The radula is not unusual. The median tooth is slender, curved forward, with a lateral cusp on either side, the first lateral is short and curved with an external cusp, the second lateral nearly twice as long, the third lateral long, sharp, and curved.

The buccal membrane is 7 pointed with 7 supports, pigmented slightly on its aboral surface. There are no traces of light organs anywhere either inside or outside of the body.

Holotype. U. S. National Museum.

Type locality. 29°11.5′N, 88°07.5′W, 200 fathoms OREGON Sta. 382, June 21, 1951.

Distribution. Upper Gulf of Mexico east of the Mississippi Delta and off the coast of Texas.

Discussion. The present species is most closely related to *Pholidoteuthis boschmai* Adam from the Dutch East Indies. It agrees with this species in all pertinent characters with the exception of the shape of the fins which is very different.

Remarks. It is curious that this common and numerous species has escaped notice up until the present time. According to Mr. Springer and Mr. Bullis, both of whom were present on the cruises when the specimens of this species were captured, this species occurs in vast schools in the upper part of the Gulf of Mexico. Mr. Springer reported that schools of this squid appear on the surface several hours after sunset, and that on occasions a school would swim past the ship for several hours. Although there is at present no proof, it may be that this squid is an important part of the diet of the sperm whale which also is very numerous in the middle part of the Gulf.

Despite the most careful handling, it was almost impossible to obtain specimens in perfect shape. In most cases the long, slender tentacles were missing, and it was most often the case that the distal portion of the arms was also missing. The surface of the animal with its lack of pigment is quite striking, but this also is probably due to handling in the process of which the majority of the very thin and delicate skin was rubbed off except in the areas where the scale-like sculpture reinforced it.

The name of the present species, *Pholidoteuthis adami,* is given in honor of Dr. W. Adam of Bruxelles, Belgium who has made so

many notable contributions to our knowledge of the cephalopods and who established the genus *Pholidoteuthis* in 1950.

Family ARCHITEUTHIDAE
Genus *Architeuthis* Steenstrup, 1857

Architeuthis physeteris (Joubin, 1899)
Figs. 10 a-h

Dubioteuthis physeteris Joubin, 1899, p. 73.
Architeuthis physeteris, Robson, 1933, p. 690 (Habitat, distribution).

Material. 1 male, ML 61.2 cm, from surface off delta of the Mississippi.

Description. The present specimen was in poor condition when captured as the head was nearly severed from the mantle and the arms and tentacles were floating free.

The *mantle* is somewhat pyriform, widest a short distance posterior to the anterior margin, and tapering to a long, narrow point posteriorly. The antero-dorsal margin forms a shallow V whereas the ventral margin is sinuous. The mantle is thick, flabby, and of the soft consistency of many deep sea cephalopods. The *head* is so damaged as to be indescribable and the eyes are missing. The *fins* are small, weakly developed, thick and flabby. They are in the form of a long, pointed oval and appear more as a border to the attenuated portion of the mantle.

The *funnel* is large and is united to the ventral surface of the head by a pair of strong bridles. No trace of a funnel organ could be found. The funnel locking apparatus is weakly developed. The funnel member is a long, slightly sinuous, simple groove of cartilage. The mantle member is a low, indistinct ridge of flesh with indistinct margins and origin.

The *buccal membrane* consists of 7 lappets without suckers and 7 supports. The median dorsal support is Y shaped, the lateral members dorsally lodged in the dorsal arms. The second pair of supports and the ventral supports are also dorsally lodged whereas the supports are ventrally lodged on the latero-ventral arms.

The *arms* are long, stout, and compressed, attenuated distally. They are in the order 1.2.4.3 but nearly subequal. All of the arms are slightly keeled, and the ventral arms are equipped with swimming membranes. The suckers are in two rows, large, and bordered on either side by a wide protective membrane with stout supports. The horny rings are badly deteriorated, but there appear to be about 38 rather large, conical, pointed teeth on the margin.

The *tentacles* are long and slender, about 4½ times the mantle length, and compressed. The clubs are only slightly expanded and attenuated distally. They are equipped with ventral keels and protective membranes. The club suckers are in 4 rows, the marginal ones small, those of the median rows about 2¼ times as large. The suckers of the hand portion have rings whose margins are armed with numerous, fine, sharp, triangular teeth. Distally the suckers become quite small. Proximal to the hand suckers are 4 rows of crowded, small suckers which narrow to 2 rows of suckers arranged in pairs distally but which gradually become separated until they appear to lie in a single row. On the middle of the stalks they are about 10 inches apart and very minute.

Although the viscera was in very poor condition, some dissection was pos-

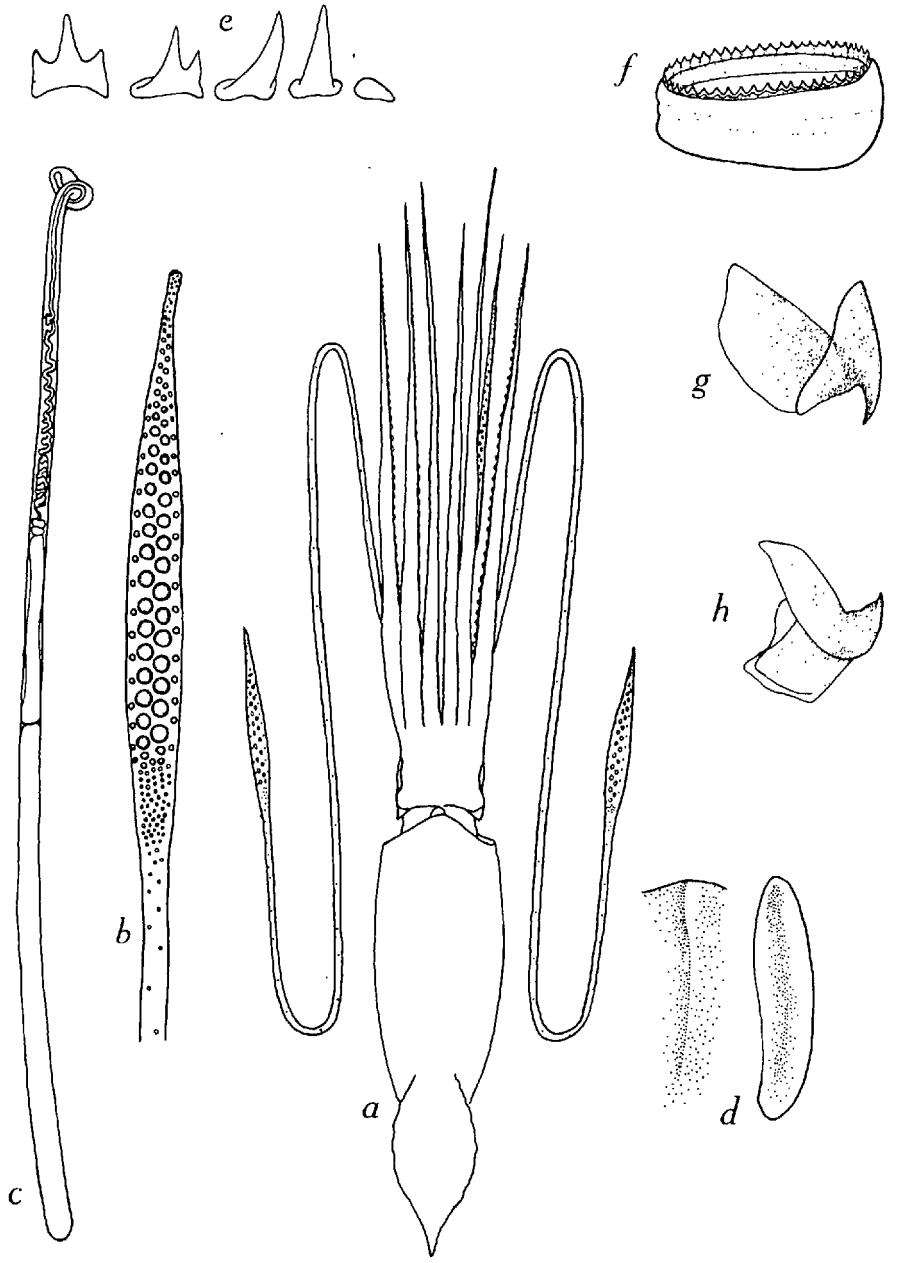

FIGURE 10. a-h. *Architeuthis physeteris* (Joubin). a. Dorsal view of male, mantle length 61.2 cm. b. Tentacular club. c. Spermatophore, 93.0 mm in length. d. Mantle locking apparatus. e. Radula. f. Lateral view of tentacular sucker. g. Upper mandible. h. Lower mandible.

sible. The stomach was examined and found to be empty. A large, free ink sac is present. The penis is very long and free of the viscera for ½ of its length or 21.2 cm. It is long, straight and tubular. A cluster of about 30 spermatophores were projecting from the end of the penis. They are about 100.0 mm in length and 1.0 mm in diameter. Although the capsule has in the main disintegrated, the important structures are observable and are shown in the figure.

The mandibles are large and well pigmented but thin. They are strongly curved and have very sharp points. The radula is small for such a large animal but seems to be of the normal type with the rhachidian having a central mesocone and an ectocone on either side of the base.

Over most of the mantle the skin is still present, and this is pigmented a dark reddish brown. Ventrally, the mantle was yellowish with numerous but uncrowded, minute, reddish brown pigment spots.

Definite measurements were almost impossible to obtain from this specimen taken in such a condition. The mantle width approximated 137.0 mm, but since it was decidedly flattened this measurement can not be trusted. The fin length of 280.0 mm and width of 168.0 mm is probably accurate. The longest arm measured 886.0 mm and the tentacle 2700.0 mm with a club length of 425.0 mm. The largest arm sucker had a diameter of 19.0 mm.

Holotype. Museum of Oceanography of Monaco.

Type locality. Off the Azores from the stomach of a sperm whale.

Distribution. Type locality and the upper Gulf of Mexico.

Discussion. The present specimen seems definitely attributable to *Dubioteuthis physeteris* Joubin with which it agrees in mantle shape, size of the fins and shape of the fins. It is not comparable to *A. clarkei* Robson which has a larger fin and somewhat differently armed sessile suckers.

This record appears to be the most southerly report of an *Architeuthis* on the east coast of the United States with the exception of a single, much mutilated specimen from off Fowey Rocks, Florida which is no longer in existence. If recollections are correct, this mutilated specimen was either *A. princeps* or *A. harveyi* on the base of the heart shaped fins.

Robson (1933) discusses in some detail the distribution and theoretical habitat of the architeuthid squids. The author agrees with him that they are in all probability very poor or weak swimmers and not at all adapted for catching active prey. Indeed, they should fall easy victims to the sperm whale, their natural enemy. They probably live, as Robson suggests, along the continental slope or beyond in depths of 100 fathoms or over where they feed on small, inactive animals.

In contrast to *Ommastrephes gigas* or others of the family the architeuthids are very poorly adapted for swift swimming. In *O. gigas,* the large squid of the west coast of South America, we have

an animal which, if reaching comparable sizes to the architeuthids, would much more live up to the reputation which these large animals have received.

Family HISTIOTEUTHIDAE
Genus *Calliteuthis* Verrill, 1880

Calliteuthis reversa Verrill, 1880
Figs. 11 a,b

Calliteuthis reversa Verrill, 1880, p. 393.
Stigmatoteuthis verrilli Pfeffer, 1912, p. 285.

Material. 1 female, ML 50.0 mm, OREGON Sta. 384.
2 females, ML 49.0, 99.0 mm, OREGON Sta. 1018.

Description. This is a small to medium species in size with a soft consistency which, except usually in small specimens, gives a tendency toward poor preservation or damage in capture.

The *mantle* is short and subconical, bluntly pointed posteriorly and small in proportion to the total length. The dorso-median section of the anterior margin is pointed, the ventral margin smooth. The *fins* are transversely oval, united posteriorly and projecting slightly behind the end of the body. The width of both fins is about 58.0—62.6 per cent of the mantle length. The *funnel* is stout with an inverted V shaped funnel organ and long oval ventral pads. The connective cartilages are oval on the funnel and simple straight ridges on the mantle.

The *arms* are long and drawn out to a rather slender point. There is a low interbrachial membrane between the dorsal arms. The suckers of the dorsal and lateral arms are in 2 rows and of moderate size. Those of the ventral arms are small, about ½ to 2/3 the size of the others. The suckers' rings are not toothed on their margins except occasionally distally where there are a few low blunt teeth on the distal margin. The buccal membrane is 7 pointed and has 7 connectives.

The *tentacles* are long, moderately stout, and somewhat triangular but flattened orally with expanded clubs. The clubs bear about 5 rows of suckers on the hand part, of which 2 rows are much larger than the others. Distally the clubs become abruptly narrower and long drawn out. The suckers of the hand part on all of the specimens are equipped with horny rings which are flared out at the top of the aperture and armed with about 33 prominent triangular teeth which are rather crowded. The carpal connectives consist of about 5 suckers without teeth but with their rims strongly flared out, and about 3 pads which, because of the peculiar sucker rings, appear to be truncated. Proximal to the carpal cluster is a more or less regularly spaced single row of about 6 pads and 6 minute cups.

The surface of the arms, head, and body is colored a deep reddish brown which in all of the largest specimens was nearly black. The surface of all of these parts bears upon it numerous large oval *light organs* which are scarce upon the dorsal surface of the head and mantle but are scattered freely over the ventral surface of the mantle and head, with a series surrounding the eyelid. Upon the base of the ventral arms are found 3 rows of light organs which more distally become 2 rows. The remaining arms all have 2 rows of light organs, consisting of a line of large ones ventrally, and a series of minute ones

dorsally. The fins are free of light organs and have no pigmentation except for a few scattered large chromatophores near the bases.

TABLE 16

Measurements (in mm) and indices of 3 specimens of *Calliteuthis reversa* Verrill from the Gulf of Mexico.

Sta.	384	1018	1018
Sex	F	F	F
ML	50.0	49.0	99.0
MWI	50.0	48.5	49.6
HWI	....	....	....
FLI	37.0	36.6	37.4
FWI	58.0	59.5	62.6
Arms			
I	67.0	....	160.0
II	66.0	....	145.0
III	66.0	....	145.0
IV	52.0	....	136.0

Holotype. U. S. National Museum.

Type locality. Off Newport, Rhode Island in 365 fathoms.

Distribution. This is uncertain due to the uncertainty of past identifications. It would appear to be restricted to the northern and western North Atlantic and the Gulf of Mexico.

Discussion. Verrill described this species from a single specimen taken off Newport, Rhode Island. While the original description was quite adequate the type was missing both tentacular clubs and hence certain pertinent details were lacking. In 1884, however, he described, but did not figure, the tentacles of a small specimen of 27.0 mm in mantle length. In his description of this he states, speaking of the hand suckers, "their horny rings are very finely and sharply denticulate around the entire margin, which is but little oblique." In the original description he stated that the arm suckers had entire margins except for the distal suckers which had a few, blunt teeth on the distal margins. Thus we have an animal with smooth arm suckers over most of the arm but with the distal suckers bluntly toothed and with the suckers of the tentacular club finely but distinctly denticulate. There is nothing ambiguous about this.

Pfeffer (1912) in his monographic review of the oegopsida characterized a group of histioteuthid squids by the presence of 3 rows of light organs on the ventral arms and a large row of light organs ventrally lodged, plus a normal row, on the remaining arms. These would correspond to the genus *Calliteuthis*. So far so well, but this group he continued to break down into two genera, *Calli-*

teuthis and *Stigmatoteuthis*. The former he diagnosed as histioteuthids with the rings of the arms and tentacular suckers untoothed and the tentacular suckers with accessory chitin structures: the latter genus he diagnosed as with the rings of the arms and tentacles toothed and the tentacular suckers without accessory chitin structures.

From what we have previously seen, the diagnosis is incorrect for *Calliteuthis,* and the only remaining structure to separate the two genera is the accessory chitin structure, the presence of which the author has been unable to verify. Naef (1923) also failed to observe this and evidently considered it an artifact of preservation.

Chun (1910) came to the decision that the genus *Stigmatoteuthis* could only at best be considered a subgenus, but he retained the character of lack of teeth on both arms and tentacles as a character for *Calliteuthis reversa* which is obviously an error. Naef (1923) states that the genus *Stigmatoteuthis* in his opinion is synonymous with *Calliteuthis*. Pfeffer further complicated things by making Verrill's second, intact specimen the type of a new species, *Stigmatoteuthis verrilli,* which has the tentacular suckers toothed!

When the present specimens came to hand the author was perplexed by this problem, and after carefully perusing the literature came to the same decision as Naef, to wit, the genus *Stigmatoteuthis* does not exist, and the name is a synonym of *Calliteuthis*.

The type of *C. reversa* in the collections of the U. S. National Museum is in very poor condition and has the appearance of once having been dried out and then returned to spirits. The arms are wrinkled, the body badly distorted, the viscera separated from the mantle, and most of the suckers are parted from the arms. A close examination of the suckers lying free in the jar disclosed that these were mainly equipped with entire marginal rings but that a few bore blunt teeth. These correspond with the suckers of the present OREGON specimens.

The radula of the type was extracted, but it was in such a poor state that attempts to mount it for examination failed. The beaks correspond well with those of the OREGON material. The indices of the present specimens and those of the type, calculated from Verrill's original measurements, seem to agree, well within the possibilities of specific range. On the basis of all of this evidence the author concluded that the material at hand belongs to this species. Although the author has insufficient material at hand it would seem that the

many specimens referred to *Calliteuthis* and *Stigmatoteuthis* may well belong to only one species which is quite variable or shows some geographical speciation.

It is also indeed unfortunate that Pfeffer and some other workers have leaned too heavily upon the appearance of larval or juvenile specimens for specific and generic determinations. The author doubts if, at present, the position of many of the species ascribed to these two genera can be settled until the larval stages have been worked out.

Family BATHYTEUTHIDAE
Genus *Bathyteuthis* Hoyle, 1885

Bathyteuthis abyssicola Hoyle, 1885
Fig. 11 d

Bathyteuthis abyssicola Hoyle, 1885, p. 272.
Benthoteuthis megalops Verrill, 1885, p. 402.

Material. 1 male?, ML 44.0 mm, OREGON Sta. 1028.

Description. This species is represented by the single beautifully preserved specimen from the above OREGON station. The *mantle* is long and subconical, tapering to a blunt point posteriorly. The dorso-median line of the anterior margin is slightly produced whereas the ventral margin is slightly emarginated. The *fins* are small and round, terminal, notched posteriorly, and with indistinct ragged margins. The *head* is broad with large and conspicuous eyes which are laterally placed and directed forward so that the eyeballs are anterior and set well away from the sides of the head.

The *funnel* is large and tubular and free for about 1/3 of its length. The funnel member of the locking cartilage is a straight groove with corresponding ridge on the mantle. The funnel organ is a small compact inverted V with small, heavy ventral pads.

The *arms* are short with wide bases and tapering, slender points, and they are in the order 4.3.=2.1. All of the arms are keeled, the ventrals conspicuously so. The arm suckers are small, and on the first, second and third arms they are arranged in 2 rows proximally and in 4 rows distally. They have small, round apertures with smooth rings. In the present specimen 1 or more enlarged suckers show conspicuously on the arms. These are in no particular pattern, but they usually occur near the mid portion of the arm. The ventral arms have biserial suckers throughout and have 3 or 4 scattered enlarged suckers.

The *tentacles* are round, grooved on the oral surface, and slender, about 3 times as long as the arms. The clubs are not expanded but consist only of about 10 rows of small suckers occupying about 15.0 mm of the tentacles. The tentacular suckers are round with broad chitinous rings and armed with small evenly spaced, numerous teeth. There is a very narrow membrane bordering the entire club for all of its length.

The *color* in alcohol is dark purplish red over the entire body except near the base of the head on the ventral surface and beneath the eyes. The color is much darker upon the arms, especially distally. In contrast to the rest of the body, the tentacular stalks are completely unpigmented.

There is no trace of the *light organs* embedded at the base of the upper 3 pairs of arms as reported by Chun (1910).

The *buccal membrane* bears a single pair of suckers on each of the lappets.

TABLE 17

Measurements (in mm) and indices of a specimen of *Bathyteuthis abyssicola* Hoyle from the Gulf of Mexico.

Sta.	1028	Arms		
Sex	M?	I	12.8	14.5
ML	44.0	II	15.0	16.5
MWI	39.2	III	15.5	16.0
HWI	56.8	IV	19.0	18.0
FLI	21.6			
FWI	50.0	DSs	0.5	
MAI	43.0	DSt	0.15	

Holotype. British Museum.

Type locality. Southern Indian Ocean between Marion Island and the Isles Crozet.

Distribution. East coast of the United States; Gulf of Mexico; Gulf of Panama; south of Cape Town, South Africa; north coast of Sumatra; south of Ceylon; Chagos Archipelago; and southern Indian Ocean.

Remarks. This seems to be a fairly cosmopolitan species from rather deep water. The somewhat soft consistency and deep red coloration are typical of animals of these depths. It seems possible that there may be 2 species confused in the literature. The present specimen has no light organs on the arms, nor is there any mention of these in the descriptions by Hoyle and Verrill. Chun, however, reported these organs in his specimens. The author has examined the type of Verrill's *Benthoteuthis megalops* and failed to find light organs present. The presence or absence of these organs would seem to be at least of specific importance.

Family OMMASTREPHIDAE

Genus *Illex* Steenstrup, 1880

Illex illecebrosus (Lesueur, 1821)

Fig. 11 c

Loligo illecebrosus Lesueur, 1821, p. 95.
Ommastrephes illecebrosus, Verrill, 1872, p. 281.
Illex illecebrosus, Steenstrup, 1880, p. 90.

Material. 2 males, 3 females, ML 148.0-189.0 mm, OREGON Sta. 481.

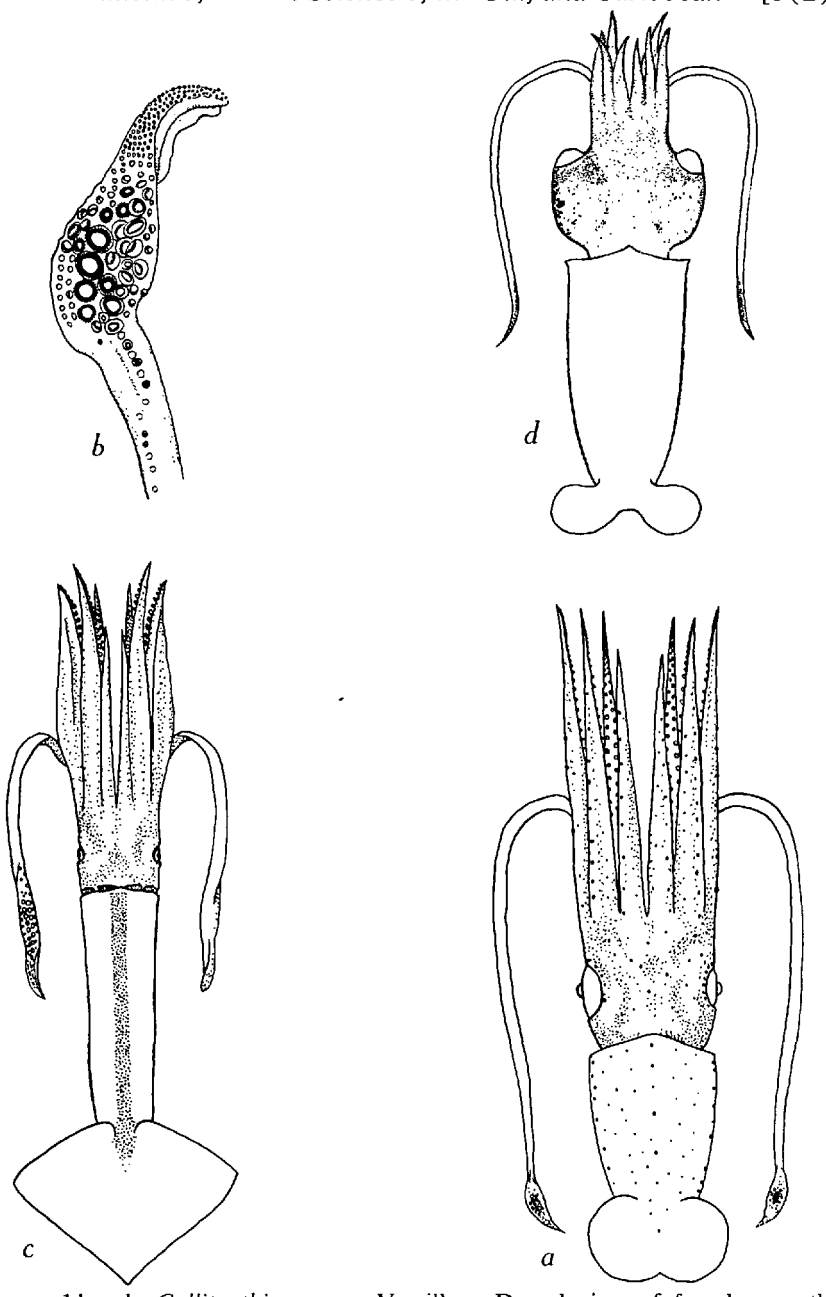

FIGURE 11. a-b. *Calliteuthis reversa* Verrill. a. Dorsal view of female, mantle length 50.0 mm. b. Tentacular club. c. *Illex illecebrosus* (Lesueur), dorsal view of male, mantle length 148.0 mm. d. *Bathyteuthis abyssicola* Hoyle, dorsal view of male, mantle length 44.0 mm.

1 male, ML 183.0 mm, OREGON Sta. 482.
3 males, 1 female, ML 134.0-151.0 mm, OREGON Sta. ? (tag number 14889 on specimens).

Description. The *mantle* is long and slender, cylindrical, tapering gradually to a point posteriorly. There are slightly forward projecting points on either side of the funnel in the position of the locking apparatus. The *fins* are short, about 1/3 of the mantle length, united posteriorly, with their posterior edges forming about a right angle at their junction. The anterior edges are rounded and free on the inner edges. The *head* is short and compact, about as wide as the mantle width, with large eyes. The eyelids have a narrow sinus in the anterior margin. The mantle locking apparatus is shaped like an inverted T.

The *arms* are stout, tapering to sharp points. The arm order is 2.3.4.1 in almost all cases. The dorsal arms are keeled, and the third arms are equipped with a narrow swimming membrane. The arm suckers are largest on the lateral arms and consist of deep, oblique-shaped suckers with oblique horny rings entire on their proximal margins but equipped on their distal half with large incurved sharp median tooth bordered on either side by about 4 or 5 flat, short, blunt teeth.

The *tentacles* are long and stout, with less than half of their length occupied by the club. The club is heavy and expanded, ending in a blunt, flattened, and curved tip. The hand portion has 4 rows of suckers of which the 2 inner rows are composed of large suckers of which the largest have smooth entire rings, but as these diminish in size the rings become incised forming large, flat-edged, blunt teeth which as they become smaller develop into sharply denticulated suckers. The marginal hand suckers are small, and the entire ring is finely and sharply toothed, the teeth being sharper and longer on the outer margin. Distally the suckers appear to be in about 8 crowded rows, small, with minute apertures. Proximally there are about 6—7 small suckers in the carpal region.

In a preserved state the *color* is usually a light reddish brown dorsally, nearly pure yellowish white ventrally, and with a broad, conspicuous dark reddish brown to purple band in the median line of the dorsal surface of the head and mantle.

TABLE 18
Measurements (in mm) and indices of 6 specimens of *Illex illecebrosus* Lesueur from the Gulf of Mexico.

Sta.	481	481	481	481	481	482
Sex	M	M	F	F	F	M
ML	162.0	158.0	189.0	148.0	153.0	183.0
MWI	....	22.8	21.2	20.9	21.6	17.0
HWI	....	24.0	18.5	18.9	20.3	20.8
FLI	40.7	44.3	42.8	41.2	42.5	42.6
FWI	64.3	59.5	51.7	55.4	53.0	52.5
Arms						
I	92.0	73.0	71.0	53.0	59.0	80.0
II	120.0	93.0	92.0	68.0	73.0	102.0
III	111.0	93.0	84.0	63.0	69.0	97.0
IV	99.0	79.0	82.0	54.0	59.0	85.0
MAI	74.0	58.8	48.7	46.0	47.7	55.7
DSs	5.5	4.7	4.5	2.5	3.0	4.3
DSt	3.5	3.5	3.5	2.2	2.0	3.2

Holotype. Type figure in Lesueur, 1821.
Type locality. Sandy Bay (Nova Scotia?)
Distribution. Northern Europe as far south as the English Channel; east coast of the United States; Gulf of Mexico; Cuba.
Remarks. This species is reported to be common in the Gulf of Mexico, especially in the northern parts. It was formerly considered to have been cut off from the east coast populations by the rise of the Florida peninsula at the end of the last glacial period. Its discovery in Cuba, however, shows that it is commonly distributed along the eastern coast of North America and the Caribbean Sea.

Genus *Ommastrephes* Orbigny, 1839

Ommastrephes pteropus Steenstrup, 1855
Figs. 12 a,b

Ommastrephes pteropus Steenstrup, 1855, p. 117.
Stenoteuthis pteropus, Pfeffer, 1912, p. 490.

Material. 2 males?, 1 female, ML 70.5-81.0 mm, OREGON Sta. 829.
1 indet., ML 52.0 mm, OREGON Sta. 1038.
4 females, ML 191.0-243.0 mm, OREGON Sta. 1086.
3 females, ML 195.0-243.0 mm, OREGON Sta. 1070.
1 female, ML 170.0 mm, OREGON Sta. 852.

Description. The animal is rather large and a powerful swimmer. The *mantle* is cylindrical, thick and stout, tapering to a rather acute point posteriorly between the fins. The anterior mantle margin is smoothly truncated, entire. The *head* is somewhat narrower than the mantle width with large eyes with open apertures and a deep sinus in the anterior edge of the eyelid. The *fins* are large, broadly sagittate, and strongly attached.

The *funnel* is strongly developed, stout, and lies within a groove in the ventral surface of the head. The groove is deeply and broadly excavated, and at the anterior end it is equipped with a series of pocket-like folds, the foveola. The locking apparatus is shaped like an inverted T with corresponding ridges on the mantle.

The *arms* are stout, strong, unequal, and usually in the order 4.3.2.1. The arms are strongly keeled with a heavy swimming membrane which is broadest on the third arms. The suckers are all bordered by broad protective membranes which have strong supports. The suckers are large, stout, in 2 rows, the rings equipped with strong, acute teeth about 28—30 in number.

The *tentacles* are stout, strongly keeled dorsally and flattened ventrally, the keel being a strongly developed swimming membrane. The tentacular club is well developed, attenuated, only slightly enlarged, and bordered by a strong protective membrane equipped with a series of stout supports. The large suckers of the hand part are in 4 rows, the ventral ones the largest, their horny rings equipped with a series of stout, sharp teeth of which one in each quarter is enlarged. The distal portion of the club is equipped with a series of 4 rows of suckers which decrease to minute members on the terminal section. The carpal

cluster consists of about 3 fleshy knobs in a single row with alternating suckers. Proximal to the last knob are 0—2 suckers on the stalk. A single specimen in the series from the Gulf of Mexico had 4 suckers proximal to the last knob, but in all other respects it is referrable to the above species. The frequency of these suckers is shown in the table.

TABLE 19

Measurements (in mm) and indices of 8 specimens of *Ommastrephes pteropus* Steenstrup from the Gulf of Mexico.

Sta.	829	829	829	1038	1086	1086	1086	1086
Sex	M?	F	M?	?	F	F	F	F
ML	71.5	81.0	70.5	52.0	191.0	243.0	193.0	197.0
MWI	20.3	21.0	20.6	21.2	26.1	28.8	25.9	29.4
HWI	22.4	22.2	19.9	21.2	19.9	....	21.8	....
FLI	43.5	39.5	39.8	36.5	46.6	47.0	46.0	50.0
FWI	70.0	63.5	58.0	58.8	79.5	80.6	85.5	84.0
Arms								
I	17.0	19.0	18.0	11.6	59.0	81.5	55.0	....
II	20.0	21.5	19.5	15.0	72.0	94.0	69.0	70.0
III	21.0	23.0	21.0	15.5	77.0	96.0	67.0	82.0
IV	14.5	15.5	21.0	12.5	73.0	110.0	49.5	83.5
MAI	29.4	29.7	29.8	28.9	40.8	45.2	38.8	43.1
Stalk suckers	2–2	2–2	2–2	2–2	0–1	1–1	2–1	4–4
DSs	0.5	0.8	0.5	0.4	3.0	5.0	3.0	2.5
DSt	0.8	0.9	0.8	0.4	4.0	6.0	4.5	4.2

Holotype. Not traced.

Type locality. Atlantic Ocean?

Distribution. East coast of North America from Nova Scotia to the Caribbean; Gulf of Mexico; Great Britain; west coast of Africa; Ivory Coast, Cape Verde Islands.

Discussion. Adam (1952) has critically studied a large number of specimens of this species from the west coast of Africa, and little can be added here concerning the present material. As with Adam's material, the present specimens show a tendency to overlap with *O. bartrami* in the character of the suckers on the tentacular stalk proximal to the last pad. According to Pfeffer's diagnosis the specimen of 197.0 mm with 4 suckers on the stalk should belong to this latter species, but the other characters seem to justify keeping it within the present species. No specimens of *O. bartrami* have yet come to hand from the Florida or Gulf of Mexico areas.

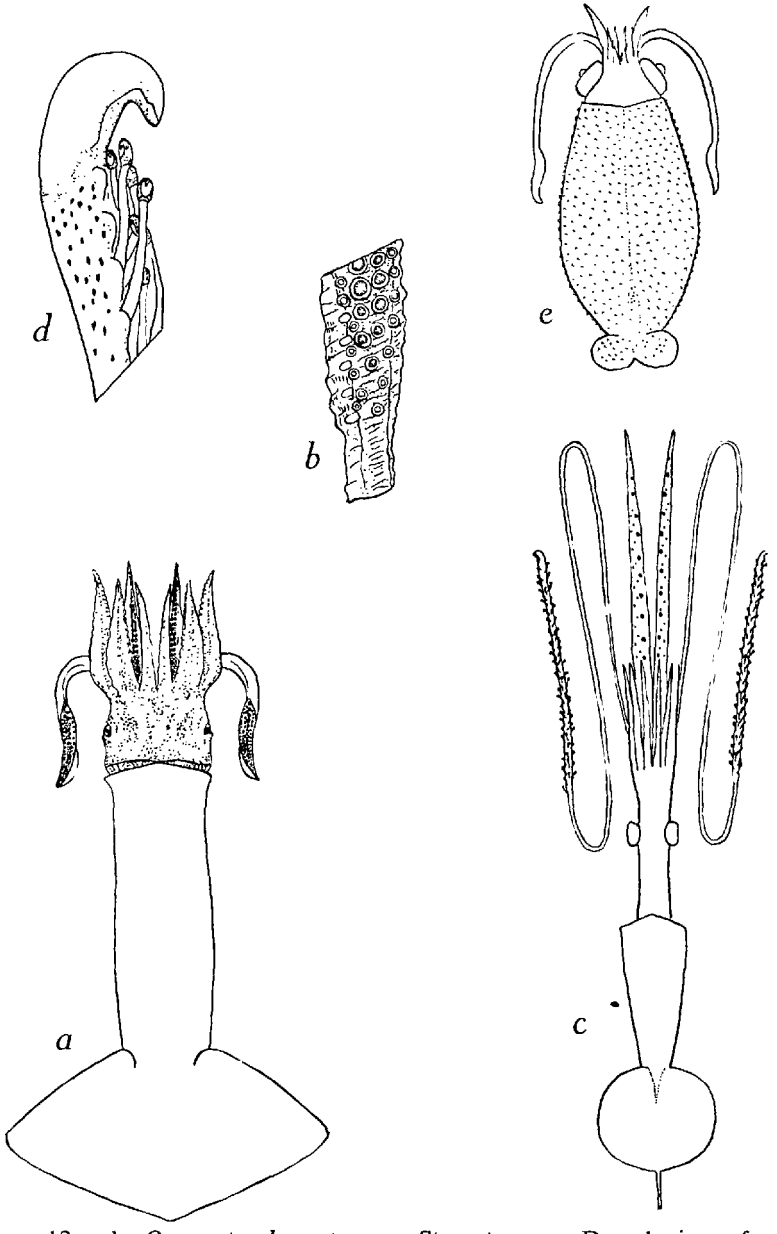

FIGURE 12. a-b. *Ommastrephes pteropus* Steenstrup. a. Dorsal view of male, mantle length 81.0 mm. b. Enlarged section of base of tentacular club to show carpal cluster. c-d. *Chiroteuthis lacertosa* Verrill. c. Dorsal view of female, mantle length 57.0 mm. d. Greatly enlarged tip of tentacular club showing light organ. e. *Cranchia scabra* Leach, dorsal view of male, mantle length 65.0 mm.

Family CHIROTEUTHIDAE
Genus *Chiroteuthis* Orbigny, 1839

Chiroteuthis lacertosa Verrill, 1881
Figs. 12 c,d

Chiroteuthis lacertosa Verrill, 1881, p. 102.

Material. 1 female, ML 57.0 mm, OREGON Sta. 384.

Description. The following description is based upon the single specimen recorded above. The *mantle* is long, slender, the width about 5.7 per cent of the mantle length, and it is broadest anteriorly, tapering gradually posteriorly to just behind the anterior edge of the fins where it becomes small and tubular to the end of the body. The *fins* are large, nearly as long as wide, and together are circular in outline. The *head* is small and narrow with small round eyes, the entire head measuring about 68.5 per cent of the mantle length.

The *funnel* is short and stout and is united to the head for all of its length. The dorsal funnel organ is somewhat bluntly triangular with thick ventral pads.

The *arms* are long, in the order 4.3.2.1, the fourth arms very long and stout while the first arms are short. The rest of the arms are subequal. All of the arms are nearly round in cross section and soft. The ventral arms are bordered on the dorsal edge by a broad, stout, swimming membrane. The suckers are small, in 2 rows throughout, and mounted on long, slender pedicels. There is a supplementary chitinous ring surrounding the heavily pigmented aperture. The ring bears a series of numerous fine, small, pointed teeth on the outer margin. There is a single row of light organs on the fourth arms, a light organ alternating with a sucker and nearly in a row along the dorsal edge.

The *tentacles* are very long and slender, the total length of the left tentacle being about 350.0 mm and round in cross section. The clubs are only slightly expanded and long, 82.0 mm, and about 23.3 per cent of the tentacle length. The tentacular suckers are arranged in 4 rows but in a regular pattern which is unusual in the oegopsids. The outer row on either side is raised on long pedicels, and the suckers of the inner row are on shorter pedicels attached at their bases in such a way that the suckers seem to be arranged in alternate pairs. The suckers have oval apertures, and the horny rings bear about 10 small, sharp teeth on the distal border with a median, large, sharp, curved, hook-like tooth. The entire club is bordered on either side by a wide membrane with strong, stout supports. The distal end of each club terminates in a peculiar lobate, inwardly curled organ which appears to be of a luminous nature, the outer surface rounded and white, the inner surface with a very dark coating. Proximally there is no adhesive pad or carpal cluster, but on either stalk there are 3 widely spaced, low, thick suckers which appear to be somewhat degenerate and without a distinct inner cup.

TABLE 20
Measurements (in mm) and indices of a female specimen of *Chiroteuthis lacertosa* Verrill from off the coast of Alabama.

ML	57.0	Arms	
MWI	5.7	I	21.0
HWI	5.7	II	26.0
FLI	45.5	III	27.0
FWI	46.5	IV	88.0

The internal organs were not dissected out, but there is a large, oval light organ attached to the dorsal surface of the rectum and lying superficially on the ventral surface of the viscera. The radula, beaks and other parts were not examined.

Holotype. U. S. National Museum.

Type locality. Nova Scotia.

Distribution. North Atlantic; Nova Scotia to Gulf of Mexico.

Remarks. This is an uncommon species of which, unfortunately, all too little is known. It seems, however, to be quite different from the other species of the genus. It would be interesting to theorize on the value of the peculiarly arranged tentacular club and the large terminal light organ. In an animal apparently poorly suited for swimming, and living in the darkness of the deep sea, it would appear that the extremely long tentacular stalks might be for lowering the long, well armed clubs below the body where the luminous organs would attract planktonic animals within reach of the tangle of hooked suckers which in turn might act like a "jig" used by fishermen. Such an adaptation might easily be a very efficient food catcher and no other explanation seems plausible. The stomach of the specimen was opened, but no food of any description could be found.

Genus *Mastigoteuthis* Verrill, 1881

Mastigoteuthis sp.

Material. Head and arms, lacking tentacles, OREGON Sta. 796.

Description. A single *head* with arms intact but lacking the tentacles was taken at the above station. The head assemblage was parted from the body just posterior to the funnel, and most of the skin is lacking from the head and arms. The head appears to be small but with large, equally developed eyes which project only slightly. There are no light organs on the eyeball. The funnel locking cartilage is ear-shaped, truncated posteriorly, and with a strong ventromedian ridge, deeply excavated.

The *arms* are in the order 4.3.2.1 of which the fourth arms are twice the length of the others and very broad and stout. The suckers are in 2 rows, raised on pedicels, and uncrowded. The chitinous rings are smooth for about 2/3 of the ring, but the distal edge has a row of about 8—10 sharp, slender teeth, somewhat flared out. The tentacles are missing from just above the base. The few fragments of skin are a deep purplish red with no indications of light organs.

Due to the incompleteness of the present specimen no specific determination is possible at this time as this is a large group containing about 13 species, many of them very poorly known. There seems to be no question, however, that the parts belong to the genus *Mastigoteuthis.*

Genus *Grimalditeuthis* Joubin, 1898

Grimalditeuthis bonplandi (Verany, 1837)
Fig. 13 b

Loligopsis bonplandi Verany, 1837, p. 99.
Chiroteuthis bonplandi, Ferussac and Orbigny, 1839, p. 326.
Grimalditeuthis richardi Joubin, 1898, p. 101.
Grimalditeuthis bonplandi, Pfeffer, 1912, p. 628.

Material. 1 spec., ML 89.0 mm, OREGON Sta. 1273, from stomach of *Alepisaurus ferox.*

Description. The *mantle* is soft, somewhat gelatinous, spindle-shaped, the posterior third elongate and tubular. The anterior margin is produced forward in the midline as a triangular point. The ventral margin is emarginated with slight projections on either side of the mantle. The *head* is narrower than the mantle, elongate, and the eyes project strongly from the sides.

The *fins* are large and together are transversely elliptical, occupying about 47.0 per cent of the mantle length. The fins are lightly pigmented with minute reddish brown spots except for a border around the edges which is transparent. In the present specimen the posterior fins are missing, the connecting tubular section being broken off just posterior to the large fins.

The *funnel* is large and extends well past the anterior margin of the mantle and almost to the posterior border of the eye opening. The funnel organ was not observed. The mantle locking apparatus is not present in this genus and instead the mantle is united to the sides of the funnel in a manner similar to that found in the Cranchiidae.

The *arms* are large, soft, and gelatinous and in the apparent order 3.4.2.1. The suckers are biserial throughout and are mounted upon short heavy bases from which rise short pedicels bearing the suckers. The short columns bear three fleshy papillae on the proximal side within which the sucker nestles, mounted upon a pedicel which arises on the distal side of the basal column. The basal suckers have short pedicels and are barrel-shaped with small apertures. Distally the suckers have longer pedicels and become more cup shaped, the apertures wide with teeth on the distal or upper half of the chitinous ring. The distal tips of the arms are devoid of suckers and are round and smooth. There are no swimming membranes or protective membranes on any of the arms.

The *tentacles* are lacking and there is not even a trace of their bases.

TABLE 21
Measurements (in mm) and indices of a specimen of *Grimalditeuthis bonplandi* (Verany) from the Gulf of Mexico.

Sta.	1273	Arms	Right	Left
Sex	?	I	50.0	49.0
ML	89.0	II	58.0	55.0
MWI	....	III	62.0	53.0
HWI	....	IV	62.0	....
FLI	47.0			
FWI	65.0			

Holotype. Not traced.
Type locality. Sea surface, 29°N, 39°W.

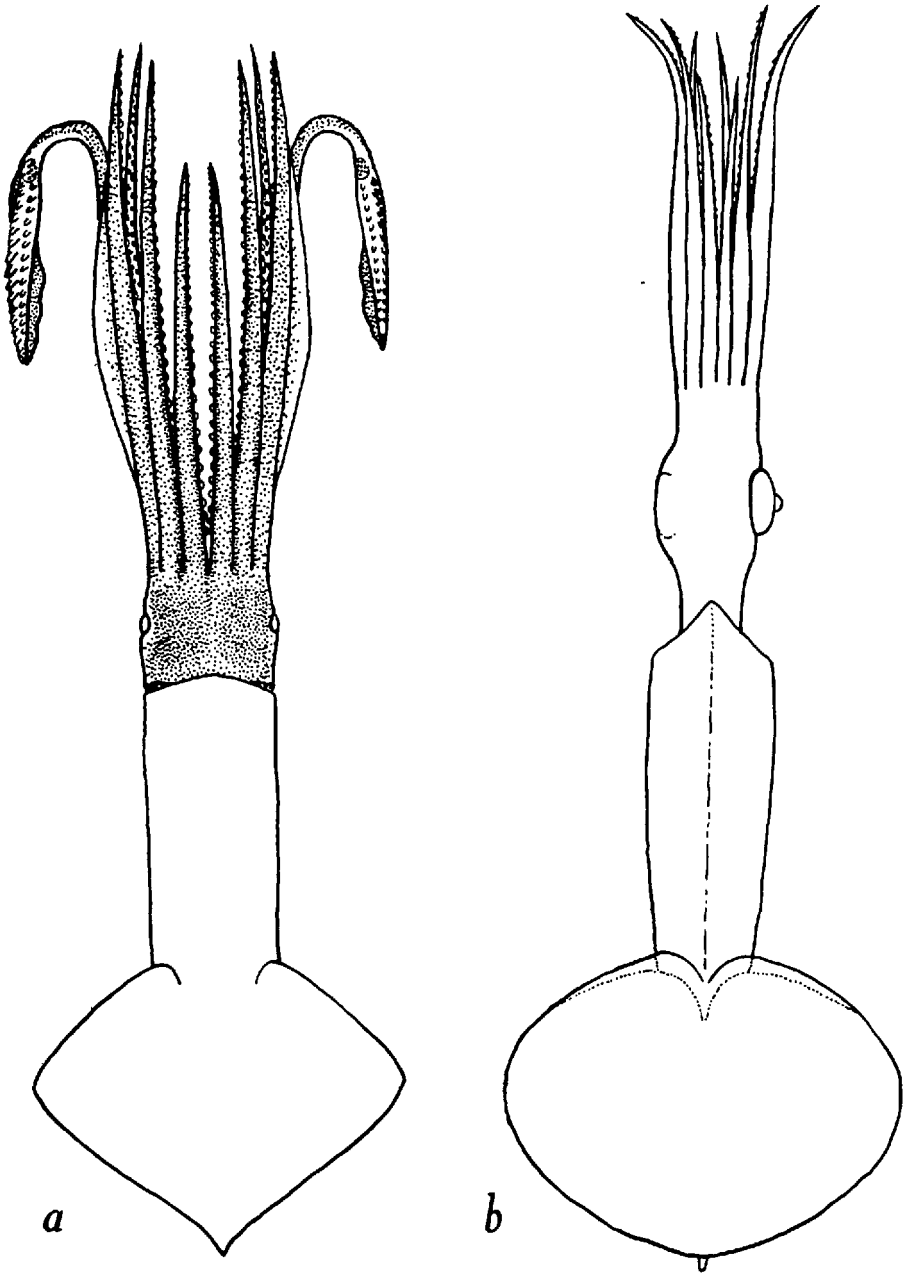

FIGURE 13. a. *Ancistroteuthis lichtensteini* (Orbigny), dorsal view of female, mantle length 61.0 mm. b. *Grimalditeuthis bonplandi* (Verany), dorsal view of individual with mantle length of 89.0 mm.

Distribution. Open Atlantic; Azores.

Discussion. This species has been handsomely figured by Joubin (1900) from a specimen obtained by the Prince of Monaco. Pfeffer (1912) has again figured it and has given a good description of the species based upon several specimens. The present specimen was not in good shape and the figure here given is somewhat of a reconstruction as concerns the body outline. The author was unable to ascertain teeth in all of the suckers but Joubin figures them in his plates. He shows them to be small teeth on the distal border of the aperture. Evidently the tentacles are lost at a very early stage since no trace of them remains.

The relationship of this genus is still somewhat doubtful. Pfeffer placed it in a separate family, the Grimalditeuthidae, though admitting its affinities with the Chiroteuthidae. The fusion of the mantle with the funnel is reminiscent of the Cranchiidae but a somewhat similar fusion is found in *Symplectoteuthis* which belongs to the Ommastrephidae. Subsequent to Pfeffer, most authors have placed the genus in the Chiroteuthidae.

Family CRANCHIIDAE
Genus *Cranchia* Leach, 1817

Cranchia scabra Leach, 1817
Fig. 12 e

Cranchia scabra Leach, 1817, p. 140.

Material. 1 male, ML 65.0 mm, OREGON Sta. 516.

Description. The *mantle* is broadly oval or barrel-shaped, somewhat sinuous along the anterior margin and bluntly rounded posteriorly. The entire surface of the mantle is covered with closely set, star-shaped tubercles which are also found on the dorsal surface of the fins. The *gladius* distinctly shows through the dorsal surface of the mantle, and there are two inverted V-shaped rows of tubercles at the fusion of the mantle with the funnel. The *fins* are terminal, small, rounded, and with united borders posteriorly. The *head* is small, and compact, with large outstanding eyes.

The *funnel* is small and stout, free for ½ of its length. The funnel organ is half round with a median papilla. The ventral pads are broadly oval.

The *arms* are short and slender, in the order 3.2.4.1, the first pair very short. The arm suckers are arranged in 2 rows of which the largest suckers on the third arms were 0.6 mm in diameter. The sucker rings are entire, and smooth. All of the arms are bordered by protective membranes with prominent supports.

The right ventral arm is *hectocotylized*. The suckers are smaller than in the corresponding left arm, and they are in 4 rows proximally for about 2/3 of the arm length. The third arms show modifications in the male with the distal end bearing 4 rows of minute suckers. The rest of the arm is equipped with 2 rows.

The *tentacles* are stout, thick at their bases, with a shallow groove on the oral face. Distally the stalk becomes slender with a moderate expansion at the club. The stalk is armed with a series of small suckers in pairs which are arranged in a zigzag fashion. The suckers of the tentacular club are 0.5 mm in diameter in the hand part and arranged in 4 rows. The sucker rings are equipped with small, evenly spaced teeth.

In the specimen from the Gulf of Mexico the eyeball is so damaged that the exact pattern and number of the *light organs* cannot be ascertained. However, according to Chun (1910) there are about 13 oval light organs in 2 semicircles on the eyeball of which all but 2 are on the ventral surface.

Holotype. British Museum.

Type locality. Unknown.

Distribution. Cosmopolitan in all temperate and warm seas, seldom being found close to shore.

Remarks. This is the only specimen recorded, apparently, from the Gulf of Mexico although small specimens are very numerous in plankton tows from the Florida Current.

Order VAMPYROMORPHA
Family VAMPYROTEUTHIDAE
Genus *Vampyroteuthis* Chun, 1903

Vampyroteuthis infernalis Chun, 1903
Fig. 14 a

Vampyroteuthis infernalis Chun, 1903, p. 88.
Vampyroteuthis infernalis, Pickford, 1949 (External morphology).

Description. The author has not been fortunate enough to examine a specimen of this remarkable species, but it has been reported from the Gulf of Mexico on the basis of a specimen captured by the ATLANTIS. This species is superficially highly variable in appearance due to the peculiar metamorphosis which it undergoes and the changes which take place during growth. This species has been thoroughly monographed by Pickford (1949) for the external morphology. The following brief description is taken from the above work and is that of an adult specimen.

The *mantle* is short, narrower than the head, and rounded posteriorly. The *head* is very large and nearly twice the width of the mantle with no demarcation between the two. About midway of the mantle on the dorso-lateral side is a single pair of long, oval *fins* which are constricted slightly at the base and broadest in the middle, a little pointed distally. Posterior to the fins and slightly below them is a pair of small pits which are the vestiges of the posterior fins which are present in the larval stage.

Dorsal to these pits is a single pair of large, eye-like luminous organs. A pair of composite light organs is present on the back of the neck, and each consists of about 53 phosphorescent nodules arranged in a cluster. In addition to these light organs there are a large number of simple phosphorescent nodules embedded in the skin on the aboral surface of the web, infrequently on the dorsal surface of the mantle and fins, but clustered about the bases of the fins and around the funnel opening.

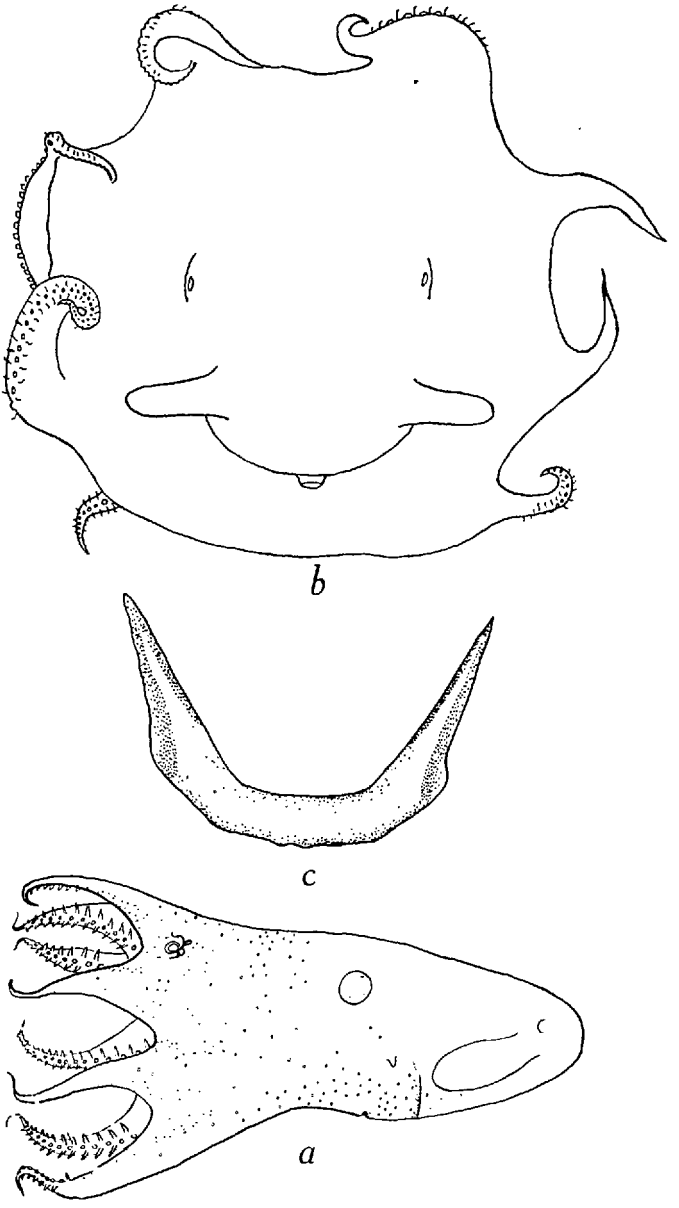

FIGURE 14. a. *Vampyroteuthis infernalis* Chun, lateral view (after Pickford, 1949). b-c. *Opisthoteuthis agassizi* Verrill. b. Dorsal view of female, mantle length 25.0 mm. c. Shell vestige.

The *funnel* is almost completely sunken into the tissues but part may project distally. The base is emarginated, and on either side is a cup-shaped depression or flap which may be considered to be the funnel adhesive organ. The mantle aperture is very wide, C, and extends to the level of the pupil on either side.

The *arms* are nearly subequal with the anterior pair slightly larger, long, and in the order 1=2.3=4. The extremities of the arms are greatly attenuated, long and filamentous. The web is extensive and deep. The suckers are arranged in a single series alternating with pairs of cirri. Distally the suckers are degenerate and are replaced by sucker bearing papillae which extend outward on the attenuated portions of the arms. The cirri are in pairs, cylindrical, and usually bluntly pointed.

Between the bases of the first and second arms on either side is a single filament which is extremely long and slender. This is actually the second pair of arms so that the Vampyromorpha possess 10 arms, standing in an intermediate position between the Teuthoidea and the Octopoda.

The *color* in fresh specimens is jet black, but this usually is easily rubbed off and in preserved specimens it appears more in the nature of dark mottlings. For full details of the morphology of this interesting species see Pickford (1946, 1949).

Holotype. Zoologische Museum, Berlin.

Type locality. Off the Cameroons-Congo River in 656 fathoms.

Distribution. Worldwide in warm and temperate waters.

Order OCTOPODA
Family OPISTHOTEUTHIDAE
Genus *Opisthoteuthis* Verrill, 1883

Opisthoteuthis agassizi Verrill, 1883
Figs. 14 b,c

Opisthoteuthis agassizi Verrill, 1883, p. 113.

Material. 1 female, ML 25.0 mm, OREGON Sta. 350.

Description. The present specimen is somewhat damaged and therefore some measurements were impossible to obtain with any degree of accuracy.

The *mantle* is short and stout, strongly depressed, and in the present specimen it is so wrinkled that the mantle length of 25.0 mm is strongly in doubt. The width is impossible to obtain. The posterior end of the body strongly overhangs the mant.e aperture and funnel which are hidden from view. The *head* width was about 38.0 mm, the eyelids narrow and the eyes obscured. The *fins* are of medium length with nearly parallel edges (15.0 mm x 7.5 mm), the width across both fins about 40.0 mm. The *funnel* is well developed, free for about half of its length and projecting through a very narrow aperture.

The mantle is so strongly depressed and confluent with the web that it is difficult to tell where one begins and the other ends. The *web* is flattened into a round disc in the middle of which rests the small body and projecting beyond are the distal portions of the arms. The web depth in the present specimen is about 67.0 per cent of the arm length and is deepest in sector A with a formula of ABC=DE. The *arms* are deeply involved in the web, rather stout, and in the order 1.2.3.4. The suckers show the typical arrangement of this species. They are small, uniserial, and closely spaced. The first 4—5 suckers are quite small

followed by about 6—7 large suckers which gradually decrease in size becoming small in the mid-section of the web but again increasing in size near the border of the web. Distal to the web they again decrease in size to the extremity of the arms. The suckers are bordered on either side by a row of cirri which do not extend far from the suckers and never exceed the diameter of the suckers in length. These cirri are closely adjacent to the suckers proximally and distally but are situated rather far from them in the mid-section of the web.

The *color* is chocolate brown both above and below, the fins pale with pale sections near the edge of the web and about the eyes. The internal anatomy was not observed in its entirety due to the poor state of preservation of the viscera. However, a few observations could be made which are of value due to the almost complete lack of knowledge of this species. The gills are small, and compact, with 3 demibranches on the inner surface and 4 lamellae on the outer surface. When the mantle was opened a single, semicircular shell vestige was found lying loosely in the sac. The fin musculature projects strongly into the mantle cavity and is attached to deep cavities in the arms of the shell vestige. No radula occurs in this species.

The *remains* of the stomach were opened and the contents examined. Although none of the animal *remains* were in such condition as to permit positive identification, numerous small crustaceans were present, and the appendages of polychaetes, bristles, etc. were observable. The anterior part of a small amphipod and the distal portion of the abdomen of a mysid were seen. The contents examined seemed to indicate that the diet was planktonic in nature.

Holotype. U. S. National Museum.

Type locality. Off Grenada, West Indies in 291 fathoms.

Distribution. North Atlantic; east coast of the United States; Gulf of Mexico; Caribbean.

Discussion. The positive proof of a typical cirromorph shell vestige would seem to negate Berry's (1918) division of the genus into *Opisthoteuthis* and *Teuthodiscus* on the basis of the shell vestige, since it is shown that the vestige is not in two parts as Verrill inferred. Robson (1931, p. 168) is completely justified in assumption that Verrill was in error.

Family OCTOPODIDAE

Genus *Tetracheledone* Voss, 1955

Tetracheledone spinicirrus Voss, 1955

Figs. 15 a-h

Tetracheledone spinicirrus Voss, 1955, p. 107.

Material. 1 male, partly torn, OREGON Sta. 489.
2 males, ML 59.0, 66.0 mm, OREGON Sta. 1006.

Description. This species, only recently described by Voss (1955) from ATLANTIS material from Cuba and ANTILLAS specimens from off Jacksonville, Florida, was originally thought to be one of the northern eledonids. It is very distinct in appearance due to the surface sculpture and the prominent ocular

cirri. The description below is that of the original description somewhat amplified by the present specimens.

The *mantle* is globular and nearly as wide as long. The *head* is 63.0 to 75.0 per cent of the mantle length and bears rather small eyes. The *arms* are nearly

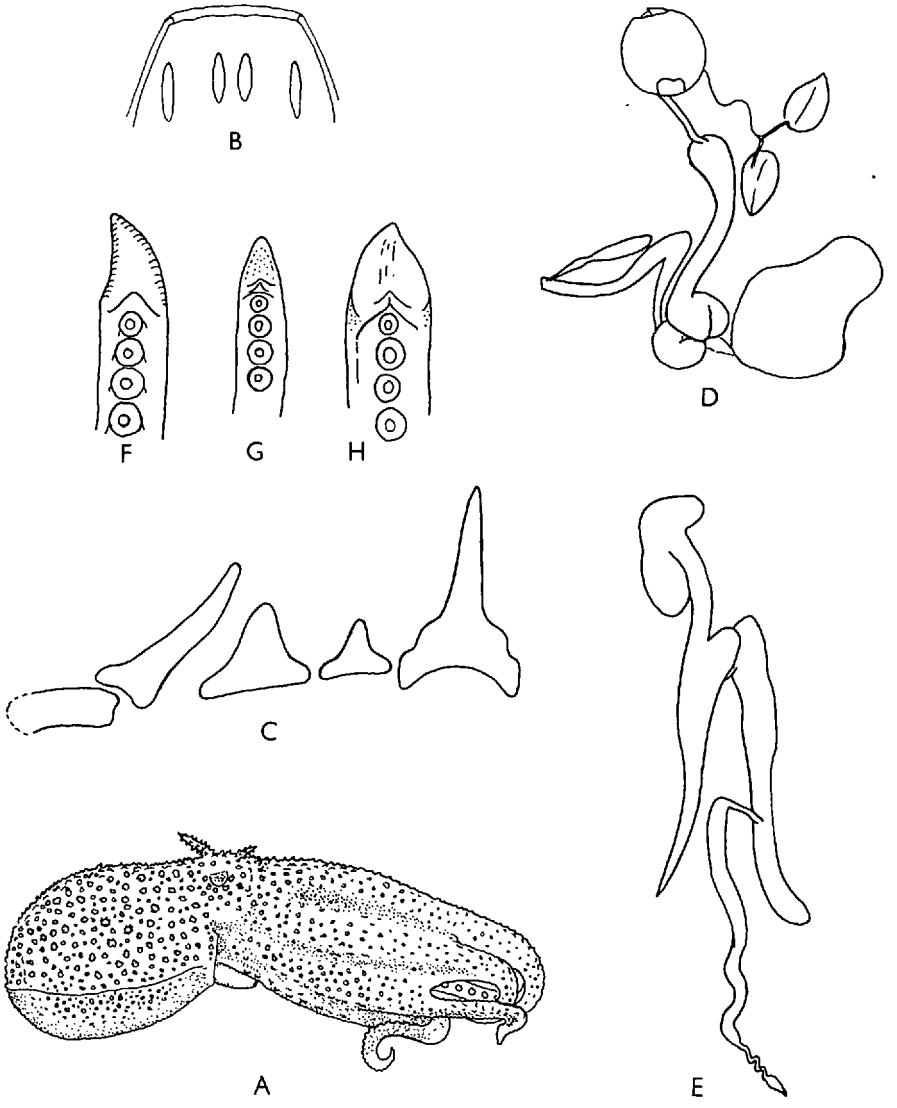

FIGURE 15. A-H. *Tetracheledone spinicirrus* Voss. A. Lateral view of holotype, mantle length 37.0 mm. B. Funnel organ. C. Radula. D. Digestive tract. E. Male genitalia. F. Ligula of Gulf of Mexico specimen. G. Ligula of holotype. H. Ligula of specimen from off Jacksonville, Florida. (From Voss, 1955).

subequal, in the order 3=2.1.5 (OREGON 2=3.1.4 or 3.1.2.4) and with a length of about 242.0 to 200.00 per cent of the mantle length. The *web* is deep with the formula CDBE=A. The suckers are uniserial, small and deeply set with an index of 5.3 to 9.0.

The *funnel* is short and stout. The funnel organ is unlike that of any other octopod in the Gulf of Mexico region. It is composed of four separate, elongate parts of approximately equal size.

The third right arm is *hectocotylized* in the males. In the ATLANTIS specimens the ligula index was 4.3 to 7.2, but in the two large males from the Gulf the indices are 8.5 to 9.6. Otherwise they are similar. The gills in both of these latter specimens have 6 lamellae as compared with 7 to 9 for the Cuban material.

The radula consists of a simple, unicuspid rhachidian, small admedians, second laterals with a single stout tooth, saber-like third laterals and flat, plate-like marginals.

The surface sculpture consists of closely set, large, stellate tubercles over the dorsal surface of the web, head and mantle. In both the OREGON specimens there are 2 large conspicuous cirri over each eye, and there is a narrow *Scaeurgus* type ridge or skin fold with round tubercles running from the aperture around the mantle.

TABLE 22

Measurements (in mm) and indices of 2 male specimens of *Tetracheledone spinicirrus* Voss from the Gulf of Mexico.

Sta.	1006	1006
ML	59.0	66.0
MWI	93.2	82.0
HWI	79.8	65.2
Arms		
I	127.0	128.0
II	142.0	132.0
III	136.0	124.0
IV	119.0	127.0
Hect. arm	118.0	93.0
Ligula length	9.5	9.0
Gills	6	6

Holotype. Museum of Comparative Zoology.

Type locality. Off Matanzas, Cuba in 145-190 fathoms.

Distribution. Off Jacksonville, Florida; Gulf of Mexico; north and south coasts of Cuba.

Genus *Octopus* Lamarck, 1798

Octopus vulgaris Lamarck, 1798

Fig. 16 a

Octopus vulgaris Lamarck, 1798, p. 130.
Octopus vulgaris Pickford, 1945, p. 708.

Material. 1 male, 1 female, ML 83.0-98.0 mm, OREGON Sta. 33.
1 male, 2 females, ML 70.0-90.5 mm, OREGON Sta. 34.

1 female, ML 46.0 mm, OREGON Sta. 141
1 female, ML 69.0 mm, OREGON Sta. 142.

Description. The *body* is saccular but very variable, especially with age. The mantle width is about 65.0 to 75.0 per cent of the mantle length. The *head* is small, the head breadth being larger in the smaller specimens and increasing with growth.

The *arms* are rather long with an index of 78.0 to 79.0, although certain individuals may have a much higher index with long, attenuated arms. In the younger specimens the arms tend to be shorter. Usually the arm order is 3.2.4.1, although occasionally the 4th arm may be shorter. The suckers are large and stout, and in the males there are often especially enlarged suckers which are of a very large size. The web depth is usually in the order CDEBA.

The skin in this species is usually rugose in nature, but this character may depend largely upon the state of preservation or upon the preserving fluid. The rugosities usually take their origin from cirri which are contracted on the dorsal surfaces. Ocular cirri are often present and may be two in number.

The *color* in well preserved specimens is most often a deep reddish brown, although some specimens may be much darker and reticulations may be present.

The number of primary gill lamellae per demibranch is variable over a wide geographic range, but it is fairly constant within any given area. In the Gulf of Mexico the number seems to be about 7 to 9.

The *hectocotylized* arm is rather short, but the most remarkable feature is the very small size of the ligula, which in this species rarely exceeds 2.0 per cent of the arm. The calamus length is about 50.0 per cent of the ligula length, and there does not appear to be any transverse ridges or rugae. The penis is of moderate length, and the diverticulum is small and rounded.

All of the specimens taken by the OREGON were obtained by the use of commercial trawls and were badly damaged. Thus accurate measurements were unobtainable.

Holotype. Non extant.

Type locality. Mediterranean Sea?

Distribution. North and South Atlantic; West Africa; Mediterranean; Atlantic coast of Europe to Great Britain; Western Atlantic from New York to Brazil, Gulf of Mexico.

Remarks. This species has long been confused in the literature under the name *O. rugosus* Bosc. Pickford (1945) has shown that at least the Western Atlantic forms thus named all belong to the generally accepted common octopus, *O. vulgaris.* This name has never been widely used in the United States for our common octopus, and the synonymy of this species is rather extensive.

Octopus joubini Robson, 1929
Fig. 16 b

Octopus joubini Robson, 1929, p. 50.
Octopus joubini, Pickford, 1945, p. 757.

Description. No specimens of this species were taken by the OREGON, since this species lives in shallow inshore waters. A damaged specimen from Marco

Island is in the author's collection but is unsuitable for description or data. This is a small species which is often found in dead *Codakia* shells. The following description is largely taken from Pickford (1945) and Robson (1929).

The *mantle* is variable in shape but is usually long and cylindrical, nearly round or ovoid. Pickford found that the younger specimens showed less variability and were broader. The MWI averages about 53.0 to 67.0 for both male and female adults. The neck region is constricted and the head is narrow. The *funnel* is small, and the funnel organ is of the usual W shape.

The *arms* in this species are short and usually in the order 3.2.4.1, but they are somewhat subequal, being more so in the juveniles. The *web* is moderately deep, nearly subequal in the young but in the order D=CEAB in the adults. The suckers are moderately large, and especially enlarged suckers are found in the males.

The third right arm is *hectocotylized* in the male, and the ligula has an index of about 4 to 7. It is rather narrow and marked by a few shallow, transverse ridges. The penis length index is about 22.0. The diverticulum consists of about ½ the total length of the penis.

The number of gill lamellae is small, seldom exceeding 6, although occasionally a minute seventh lamella may be seen. The eggs are very large for such a small species and may reach 8.0 to 8.5 mm in length and about 3.0 mm in diameter with a short terminal stalk.

The surface of the animal is often smooth, but more often it is covered with small pinpoint spots suggesting contracted cirri or small papillae. The surface in general is reddish brown, and there may be 2 or 3 ocular cirri, although these may be missing entirely.

Holotype. British Museum.

Type locality. St. Thomas, British West Indies.

Distribution. St. Thomas; Gulf of Mexico; Florida Keys.

Remarks. This species is often found in dead *Codakia* and *Pinna* shells along the south Florida coast. It is apparently common in the eastern Gulf region from Port St. Joe to the southern tip of the peninsula.

Octopus briareus Robson, 1929
Fig. 16 c

Octopus briareus Robson, 1929a, p. 610.
Octopus briareus, Pickford, 1945, p. 748.

Description. No specimens of this species have been available from the Gulf of Mexico, although this species has been reported from there by Pickford (1945) and there are sight records. Since it is a shallow water species, no specimens were taken by the OREGON. The following description is based upon specimens from the Florida Keys and the description given by Pickford.

The *mantle* is rounded or saccular and somewhat elongated. The enlarged *head* with prominent eyes is set apart from the mantle by a constriction in the neck region. The *funnel* is well developed, free for about half of its length, and equipped with a W shaped funnel organ.

The *arms* are long, and in the usual order 2=3.4.1. The second and third arms are long and stout, much more so than the others, and conspicuous. The

suckers are very large and arranged in 2 regular rows with no especially enlarged suckers in the male. The *web* is shallow in contrast to the long arms and deeper in the young. Sections D and C are usually deepest with A and E the shallowest.

The third right arm is *hectocotylized* in the male. The ligula is spoon-shaped with about 13 transverse grooves and an indistinct longitudinal midrib. The ligula index is 3-4 with a calamus index of about 29.5. The penis has a well developed diverticulum, and the entire structure is sharply bent.

The *radula* is irregular in its seriation which is of the general A_8 type.

The *color* of the skin according to Pickford (1945) is a rather light pinkish-brown shading off to a pinkish cream on the oral surface of the web and less

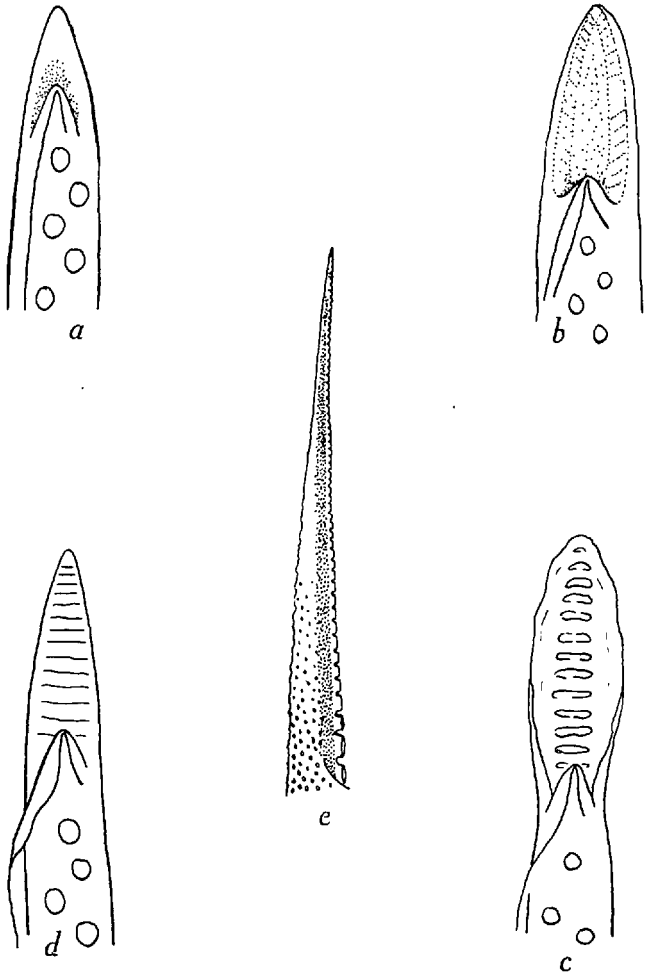

FIGURE 16. a. Ligula of *Octopus vulgaris* Lamarck. b. Ligula of *Octopus joubini* Robson. c. Ligula of *Octopus briareus* Robson. d-e. *Octopus burryi* Voss. d. Ligula. e. Lateral view of left dorso-lateral arm.

exposed under surface. The skin is granular to smooth, and there are no distinct ocular cirri although some of the papillae may become prominent over the eyes. The gills number about 6 to 8.

Holotype. Zoologisch Museum, Amsterdam.

Type locality. Curacao, Dutch West Indies.

Distribution. Curacao; West Florida; Tortugas; Florida Keys.

Octopus burryi Voss, 1950
Figs. 16 d,e

Octopus burryi Voss, 1950, p. 76.
Octopus burryi, Voss, 1951, p. 231 (Morphology).

Material. 1 male, ML 39.0 mm, OREGON Sta. 82.
2 males, ML 50.0, 54.0 mm, OREGON Sta. 237.
1 male, ML 26.5 mm, OREGON Sta. 440
1 female, ML 65.0 mm, OREGON Sta. 232.

Description. The above material was described by Voss (1951) in order to supplement the data from the holotype, the only previously known specimen. Since that report no additional material has come to hand.

The *mantle* is saccular, rounded posteriorly, the width about 67-85 per cent of the mantle length. The body is firm and the widest portion is somewhat posterior. The *head* is about as wide as the mantle and bears prominent eyes. There is a distinct constriction between the body and the head.

The *arms* are short, stout, and in the order 4=3.2.1. The *web* is of moderate depth and in the order DCEBA, D or C always the deepest and A always the shallowest. The suckers are large and evenly and widely spaced with no indication of any enlarged suckers.

The third right arm is *hectocotylized* in the male. The ligula index is about 4.1-5.5, the calamus index 25.0-45.0 and to some extent rather stout. The ligula is shallow and marked by about 15 transverse grooves.

The gills have 8 to 10 lamellae per demibranch.

The penis is long and slender and has an index of 22.2-27.8. The male and female genitalia have been described by Voss (1951). The spermatophores are long and stout. They are described in detail in the paper mentioned above. The radula has an A_2 seriation with long slender rhachidian teeth with widely arched bases.

The surface sculpture in all specimens so far examined is very characteristic being composed of small, sharply rounded papillae which are closely crowded together. This sculpture is most prominent upon the dorsum of the mantle. head and arms but continues onto the ventral surfaces but does not occur on the oral surfaces of the arms and web. The *color,* even after several years in alcohol, is still remarkably constant: the general color is a deep reddish brown which turns to a light yellow on the oral surface of the arms, head and mantle. On the dorsal side of each arm is a distinct, well marked band of dark brown or black extending from the base of the arm to the distal extremity. It ends at the base of the arm in a diffused area. It seems to be persistent and is well marked in specimens now five years in preservatives.

TABLE 23
Measurements (in mm) and indices of 5 specimens of *Octopus burryi* Voss from the Gulf of Mexico.

Sta.	82	237	237	440	232
Sex	M	M	M	M	F
ML	39.0	50.0	54.0	26.5	65.0
MWI	84.7	58.0	67.7	71.6	67.6
HWI	64.0	42.0	53.8	56.5	46.2
MAI	33.3	....	39.0	47.5	40.0
WDI	23.9	....	34.8	37.5	40.0
Gills	10	9	9	10	10

Holotype. U. S. National Museum.
Type locality. 100 fathoms southeast of Sombrero Light, Florida.
Distribution. Florida Keys and Gulf of Mexico.
Remarks. Very little is known of this beautiful small octopus. The 5 specimens recorded here and the type are the only known specimens. It apparently is a deep continental shelf species and in almost all cases has been taken from a bottom composed of broken coral and shells.

Genus *Danoctopus* Joubin, 1933

Danoctopus schmidti Joubin, 1933
Fig. 17 a,b

Danoctopus schmidti Joubin, 1933, p. 36.

Material. 1 male, ML 20.0 mm, 283 fathoms off Dry Tortugas, Florida, July 7, 1931. Leg. W. L. Schmitt.

Description. The *mantle* is compact, bluntly rounded posteriorly, and nearly as wide as long. The *head* is broad, short, and compact, with small eyes. There is no constriction in the neck region. There are 2 small, widely spaced ocular cirri.

The *funnel* is small and deeply set in the ventral surface of the head. The orifice is round and button-like, the edges rolled inward and with numerous fine plications. The funnel organ is composed of 2 widely spaced very thin V-shaped elements which are quite long. The funnel locking apparatus is strongly constructed for an octopod with strong projections on either side of the funnel which fit into corresponding pits in the mantle. The mantle aperture is narrow, the mantle edge thickened and neatly rolled back.

The *arms* are long, moderately stout, about subequal, the ventral and latero-ventrals slightly longer than the others. The *web* is deep, about 48.5 per cent of the arms and equal in all of the sectors. In this specimen the web is so deep and close that the arm length was measured from the base of the arms externally just in front of the eyes. The suckers are closely spaced in 2 rows with low and thick apertures. The walls are crossed by many fine plications. The suckers originate immediately around the mouth and extend nearly to the tips of the arms.

The third right arm is considerably shorter than the others, stouter, and

bordered by a broad extension of the web. The tip of the arm is devoid of suckers, slightly spade-like, and seems to be the beginning of a ligula. If so, the specimen is still quite immature.

The *gills* are typically *Octopus*-like with 9 lamellae per demibranch. The penis is very small, strongly angled, the horizontal member apparently a diverticulum as long as the penis proper. The specimen was not dissected further.

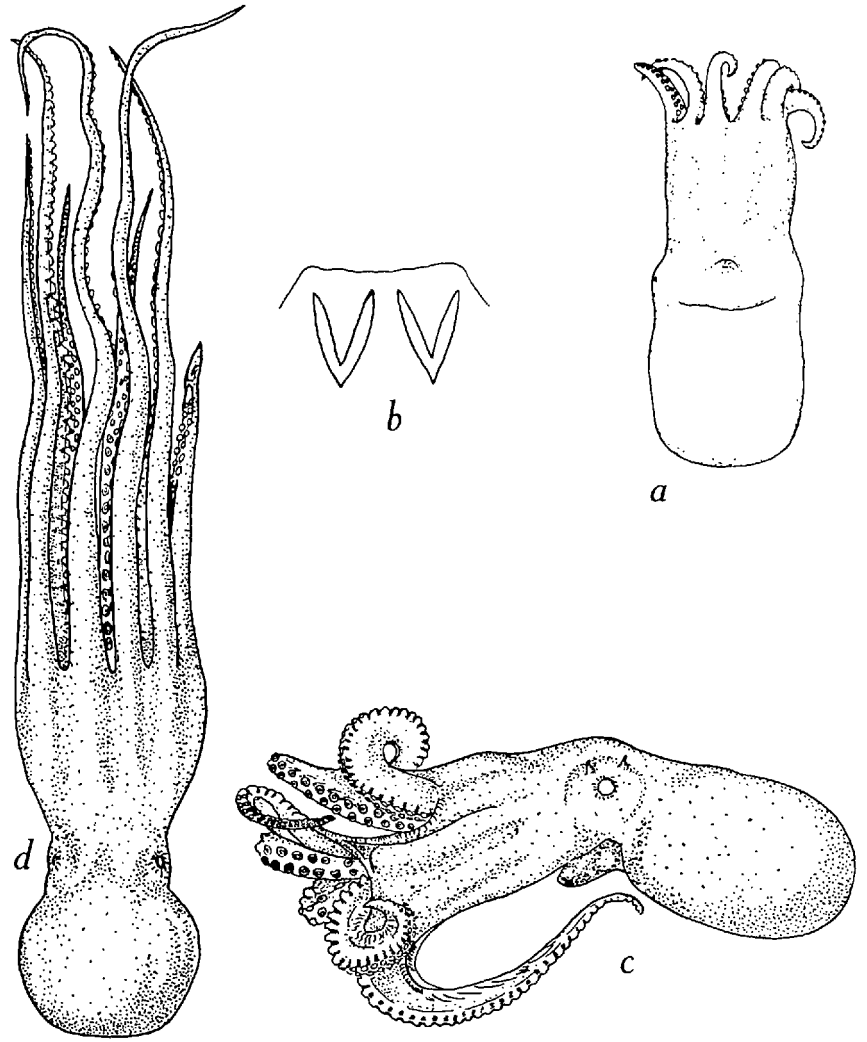

FIGURE 17. a-b. *Danoctopus schmidti* Joubin. a. Dorsal view of male, mantle length 20.0 mm. b. Funnel organ. c. *Pteroctopus tetracirrhus* (Delle Chiaje), lateral view of female, mantle length 50.0 mm. d. *Benthoctopus januari* (Hoyle), dorsal view of male, mantle length 46.0 mm.

The *skin* appears to be slightly papillose with the raised parts somewhat geometrically arranged. No particular chromatophores are visible.

TABLE 24
Measurements (in mm) and indices of a specimen of *Danoctopus schmidti* Joubin from Dry Tortugas.

Sex	M	Arms	
TL	56.5	I	32.5
ML	20.0	II	35.0
MWI	92.5	III	35.0
HWI	90.0	IV	34.0
Hect. arm	31.5	Web depth	17.0
Gills	9		

Holotype. Museum of the Institute of Oceanography, Monaco.
Type locality. Southeast of the island of Abaco, Bahamas.
Distribution. The type locality and Dry Tortugas, Florida.
Discussion. This remarkable little octopod conforms in nearly every way with the description given by Joubin (1933) from the Abaco specimen and differs in total length by only 1.5 mm, and in calculated length of the mantle by 1.0 mm. It differs from Joubin's specimen by the lack of chromatophores, apparently due to stage and preservation, and not quite such a pronounced rugosity of the skin. The plications of the web between the arms are present but not so pronounced. The funnel organ is very slender and widely spaced, and the penis shape is rather unusual. It is unfortunate that additional specimens are not available for extraction of the radula and beaks and further anatomical studies.

Genus *Pteroctopus* P. Fischer, 1882

Pteroctopus tetracirrhus (Delle Chiaje, 1830)
Fig. 17 c

Octopus tetracirrhus Delle Chiaje, 1830, pl. 73.

Material. 2 males, ML 50.0, 38.0 mm, OREGON Sta. 1006.
6 females, ML 37.0-54.0 mm, OREGON Sta. 481.
1 male, ML 41.0 mm, OREGON Sta. 445.
1 female, ML 38.0 mm, OREGON Sta. 307.
1 female, ML 48.0 mm, OREGON Sta. 476.

Description. This species was first reported from the Western Atlantic by Voss (1954) from the above specimens and in 1955 from the coast of Cuba.

The *mantle* is ovoid, the head somewhat narrower than the body although this is difficult to distinguish from the condition of the present material. A neck region is plainly visible in some. The mantle aperture is narrow. The funnel

organ is of the double V type.

The *arms* are reported never to be intact (Naef, 1923, Robson, 1929), but several of the specimens at hand have one or more of the tips complete although most of them have been lost. The extremities of the arms are very fragile. One which had all of the arms intact had the arm order of 2.1.3.4. The suckers are biserially arranged and not as deeply set into the arms as suggested by Robson (1929). This may be a matter of preservation. The web depth formula is variable and difficult to obtain in the present specimens although B or C is deepest. The web is deep and amounts to about 1/3 of the arm length.

The third left arm is *hectocotylized* in the male, the ligula being well developed and in one of the males from station 1006 the index was 6.7, somewhat greater than that given by Robson. The ligula is broad and conical with a basal calamus about 1/3 of the length of the ligula.

The skin is liberally and closely covered with small tubercles which appear almost as pigment, and there are 2 distinct cirri over each eye. The *color* in alcohol varies from yellowish brown to reddish brown. The entire surface consistency is somewhat gelatinous, more so when the material was fresher.

From the above description it would appear that there are certain differences between this material and the Mediterranean form. Perhaps a close examination of this with actual eastern Atlantic specimens might show subspecific characters.

TABLE 25

Measurements (in mm) and indices of 2 specimens of *Pteroctopus tetracirrhus* (Delle Chiaje) from the Gulf of Mexico.

Sta.	1006	1006
Sex	M	M
ML	50.0	38.0
MWI	76.0	95.0
HWI	82.3	98.0
Arms		
I	151.0	68.0
II	157.0	129.0
III	130.0	112.0
IV	120.0	112.0
Gills	9	8

Holotype. Not traced.

Type locality. Mediterranean.

Distribution. Mediterranean; east coast of Africa; Cuba; Gulf of Mexico; east coast of Florida.

Genus *Benthoctopus* Grimpe, 1921

Benthoctopus januari (Hoyle, 1885)

Fig. 17 d

Octopus januari Hoyle, 1885a, p. 229.

Material. 1 male, ML 46.0 mm, OREGON Sta. 516.
1 female, ML 54.0 mm, OREGON Sta. 481.

1 male, ML 31.0 mm, OREGON Sta. 445.

Description. The *mantle* is short and globular, widest slightly posterior to the middle, and with a distinct constriction behind the head. The width of the mantle is about equal to the length. The *head* is very narrow with small eyes which do not project. The mantle aperture is wide, the opening ending just below the eyes on either side.

The *funnel* is long, tubular, and connected with the ventral surface of the head for nearly all of its length. In neither of the 2 adults is there even a trace of a funnel organ even though they were in a good state of preservation.

The *arms* are very long and slender, about 5 times the length of the mantle. The longest arm bears about 100 pairs of suckers which are small. The arm order is 1.2.3.4 or 2.1.3.4. The web is rather deep but because of the extreme length of the arms it has a low index.

The third right arm is *hectocotylized* in the male and is very short with a moderately large ligula. The penis and diverticulum together are 41.5 per cent of the mantle length. The diverticulum is large. No spermatophores or eggs were present.

The gills are small, and there are 7 lamellae per demibranch.

The *color* in alcohol is a light purplish pink as has been observed by Hoyle (1885). The surface is smooth and regular with no cirri or papillae in evidence.

TABLE 26

Measurements (in mm) and indices of 3 specimens of *Benthoctopus januari* (Hoyle) from the Gulf of Mexico.

Sta.	516	481	445
Sex	M	F	M
ML	46.0	54.0	31.0
MWI	100.0	100.0	36.0
HWI	65.3	52.0	45.0
TL	300.0	362.0	131.0
Arms I	224.0	266.0	82.0
II	219.0	233.0	83.0
III	201.0	199.0	62.0
IV	133.0	200.0	61.0
Hect. arm	99.0	....	46.0
Ligula length	10.5	....	2.0
Gills	7		7
Web A	19.0		
B	44.0		
C	38.0		
D	36.0		
E	30.0		

Holotype. British Museum.

Type locality. Off Barre Grande, Brazil in 350 fathoms.

Distribution. Known only from the type locality and the Gulf of Mexico.

Remarks. The description of the present specimens agrees well with that of Hoyle and also with Robson. The former range was limited to northeast Brazil where they were taken in 350 fathoms in red

mud. The present specimens are from slightly shallower water, but this can easily be accounted for by the ascending isotherms in the Gulf area.

A single small male taken in 12 fathoms seems to belong to this species but identification is uncertain. The body is long and slender, pointed posteriorly, and the eyes are large and protuberant, all juvenile characters. In all other respects the description fits quite well.

Family ALLOPOSIDAE
Genus *Alloposus* Verrill, 1880

Alloposus mollis Verrill, 1880
Fig. 18 a

Alloposus mollis Verrill, 1880, p. 394.

Material. 1 male, ML 42.0 mm, OREGON Sta. 1106.
1 male, ML 60.0 mm, OREGON Sta. 383.
1 female, ML 44.0 mm, OREGON Sta. 597.

Description. This is a small to medium size planktonic species found in the vicinity of the coast. The systematics, morphology and development has been described by Sven Thore (1949).

The *mantle* is soft and very gelatinous, and as a result it is very easily torn or damaged. The mantle is short, stout, the width about 80-83 per cent of the mantle length. There is a slight constriction in the neck region, and the head width is about equal to the mantle width. The mantle aperture is wide, and the funnel organ is W shaped.

The *arms* are rather long, the first pair being the longest and the others about subequal. They are united by a deep web. The suckers are arranged in a single row within the web, but at the border of the web they are biserial, becoming uniserial again near the extremities of the arms.

TABLE 27

Measurements (in mm) and indices of 2 specimens of *Alloposus mollis* Verrill from the Gulf of Mexico.

Sta.	597	1106
Sex	F	M
ML	44.0	42.0
TL	122.0	112.0
MWI	79.7	83.0
HWI	82.0	83.0
ALI	53.0	57.0
Arms		
I	65.0	64.0
II	54.0	58.0
III	55.0	56.0
IV	56.0	50.0
Gills	...	9

The *hectocotylized* arm of the male is coiled up in a pouch and was not examined.

The gills possess 10 lamellae per demibranch.

Holotype. U. S. National Museum.

Type locality. Off Newport, Rhode Island.

Distribution. Eastern and western North Atlantic; Azores; west Africa; New England to Gulf of Mexico.

Family TREMOCTOPODIDAE
Genus *Tremoctopus* Delle Chiaje, 1830

Tremoctopus violaceus Delle Chiaje, 1830
Fig. 18 b

Tremoctopus violaceus Delle Chiaje, 1830, pl. LXX.

Material. 1 female, ML 118.0 mm, OREGON Sta. 1077.
1 female, ML 101.0 mm, OREGON Sta. 1027.

Description. The *mantle* is elongate ovoid, smooth, pointed slightly posteriorly, and compact. The *head* is about as wide as the mantle in the present specimens with moderate size eyes.

The *arms* in the young are in the order 1.2.4.3 with the first arms considerably longer than the second. In the adult the extremities of the dorsal arms are lost. The suckers are biserial except towards the tips of the arms where they are uniserial. These suckers are largest on the fourth pair of arms.

The *web* in the adult is very deep in sectors A and B completely connecting the 4 arms, but it is shallow in the remaining sectors. The *funnel* is of moderate size and projects beyond the eyes. The funnel organ is made up of a series of irregular strips. There are 2 pairs of water pores; one at the base of the dorsal arms and the other at the base of the ventral arms.

The skin is usually smooth, silvery beneath and dark reddish purple above. Although it actually appears to be smooth it is covered by a large number of very fine papillae.

In the male the third right arm is *hectocotylized,* the modification consisting of 3 distinct areas; basal, median, and distal. On the basal and median parts there is a double row of small, round suckers with small orifices. On the basal part there is a more or less regular double fringe of small processes. Towards the end of the median portion a "penis" projects from a small orifice on the dorsal surface of the arm. The distal portion consists of a "penis sac" or oval structure with an orifice at the apex. For full details see Naef (1923).

The present specimens were too distorted to render accurate measurements.

Holotype. Not traced.

Type locality. Mediterranean Sea.

Distribution. Cosmopolitan in distribution occurring in all warm and temperate seas.

Remarks. This seemingly common species is pelagic in habitat and is often washed ashore after severe storms, often in fairly large

numbers. The author has seen several specimens with a total length of over five feet. The deep reddish purple coloration and the great size of the dorsal sectors of the web make this species very easy to recognize.

Family ARGONAUTIDAE
Genus *Argonauta* Linnaeus, 1758

Argonauta argo Linnaeus, 1758
Fig. 18 c

Argonauta argo Linnaeus, 1758, p. 708.

Description. No specimens of either the shell or the animal have been seen by the author which were from the Gulf coast. The following brief description is therefore based upon material from the east coast of Florida.

Shell. The fragile, whitish, porcellaneous shell is compressed with the keel about 6 per cent or less of the aperture length. The aperture is narrow, bordered on the inner angles by an "ear" which is narrow and turned outwards. The keel has a double row of low but sharp tubercles which are numerous. The sides of the shell are covered by low corrugations which radiate outward from the columella. When fresh, the keel is brownish or black in color, but this may become rubbed off in older specimens. The shell may reach a diameter of 11 inches or more.

Female. The female which bears the shell or egg case is typically octopod in form. The *mantle* is narrow or broadly oval with a blunt apex. The *head* is small and almost contained in the mantle and equipped with prominent eyes. The mantle aperture is wide and continues on dorsad to the eyes.

The *arms* vary in length, but usually the third arms are the smallest while the fourth or first are the longest. The first arms are thicker at the base and bear a wide, thin membrane which forms the shell. The suckers are small, alternating and minute distally. There is a very low web.

Male. The males are very small in comparison to the females. The *mantle* is rounded, conical, with a large head and eyes. The *arms* are in the order 1.4.2.3 and about subequal, carrying about 12 suckers each of which the third to the sixth are very large, the distal ones minute. The funnel is not as large as in the female, but it extends beyond the eyes. The third left arm is *hectocotylized* and is autonomous, usually being carried coiled up in a sac beneath the left eye. The color is bluish white with large brown and gold chromatophores. It is planktonic and reaches a length of about 35.0 mm.

Holotype. British Museum.

Type locality. "Pelago, M. Indico, Mediterraneo."

Distribution. Cosmopolitan in warm and temperate seas.

Remarks. The shells of this species are commonly cast up on the beaches of the Gulf of Mexico although the animals are rarely seen. Another species, *A. hians,* undoubtedly also occurs within our range but no specimens have been seen. It is a much smaller species with more turned out "ears" and broader keel with fewer and larger knobs.

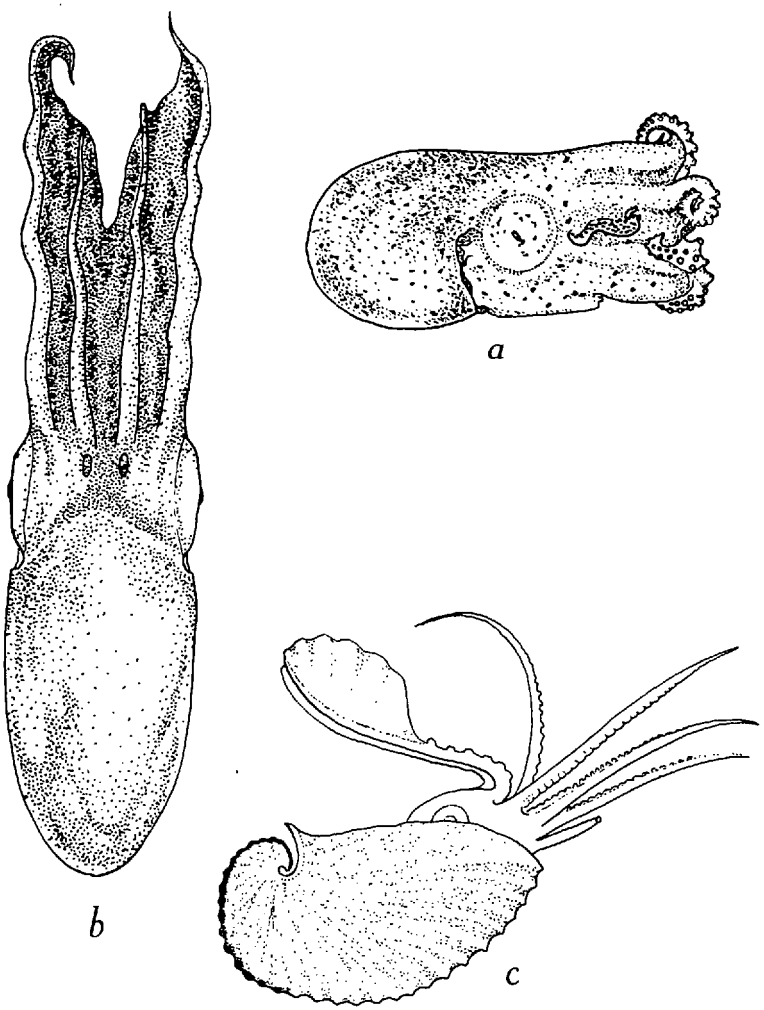

FIGURE 18. a. *Alloposus mollis* Verrill, lateral view of male, mantle length 42.0 mm. b. *Tremoctopus violaceus* Delle Chiaje, dorsal view of female, mantle length 59.0 mm. c. *Argonauta argo* Linnaeus, lateral view of female, mantle length 35.0 mm., with egg case.

OREGON STATION DATA LIST

Sta.	N. Lat.	W. Long.	Depth (in fms.)	Bottom type	Temp. (Fahr.)	Date
33	25-55	83-53	62	Sh.gy.M.	61.5	6/24/50
34	25-00	83-02	28	S.	70.1	6/25/50
35	25-35	83-42	60	Co.S.	62.6	6/26/50
81	29-20	88-07	47	.....	...	8/9/50
82	29-21	88-11	38	.....	...	8/9/50
98	29-13	88-51	34	M.	63.6	9/11/50
127	29-02	88-34	240	bk. M.	....	9/23/50
141	28-37	93-16	20	gy. M.	74.1	11/18/50
142	28-03	94-33	33	S. M.	74.0	11/21/50
148	28-21	95-00	20	S. M.	72.3	11/23/50
149	27-50	97-01	9	S. M.	62.4	11/26/50
150	27-43	96-51	15	M.	66.8	11/26/50
187	30-08.5	88-03.5	9	.....	62.6	12/14/50
232	25-03.5	83-08	30	Co. Sh.	68.3	1/19/51
237	24-46	82-59	25	Wh. M.	68.4	1/20/51
307	29-00	88-35	220	M.	49.8	4/22/51
313	29-22	88-06	43	S. M. Sh.	66.9	4/27/51
314	29-15.5	87-53	175	bu. M.	50.3	4/27/51
321	29-27	87-19	220	.....	50.1	4/28/51
328	30-04	86-48.5	27	S. Sh.	66.2	4/30/51
350	No data					
351	29-13.3	88-00	200	bu. M.	50.0	5/22/51
382	29-11.5	88-07.5	200	.....	...	6/21/51
383	29-10	88-00	300	.....	...	6/21/51
384	29-10	88-00	285	.....	...	6/21/51
407	21-38	92-10.5	29	wh.M.	67.8	8/17/51
425	19-36	91-47	24	M. S.	70.9	8/19/51
426	No data					
440	19-48	91-20	14	Sh. M.	80.8	8/25/51
445	19-48	91-20	14	Sh. gy. M.	80.8	8/26/51
476	29-06	88-30	185	gn. M.	...	9/6/51
481	No data					
482	28-57	88-42	210	gn. M.	51.4	9/7/51
489	27-44	85-09	234	bu. M.	...	9/29/51
490	27-44	85-09	215	bu. M.	51.8	9/29/51
501	27-51	91-32	220	M.	50.0	11/11/51
516	29-16	87-39	262	.....	...	4/1/52
545	27-36	95-43	300	.....	...	4/17/52
546	27-26	95-51	260	.....	...	4/17/52

OREGON STATION DATA LIST
(Continued)

Sta.	N. Lat.	W. Long.	Depth (in fms.)	Bottom type	Temp. (Fahr.)	Date
549	26-58	96-06	400	.....	...	4/18/52
550	26-55	96-25	125	.....	66.2	4/18/52
597	29-13	87-59	280	.....	55.0	7/10/52
618	29-36	87-18	120	.....	...	8/18/52
636	29-13	87-59	200	.....	...	9/18/52
638	29-14	88-19	48	.....	67.0	9/18/52
639	29-12	88-20	200	.....	...	9/19/52
640	29-01	88-24	475	.....	...	9/19/52
796	29-10	87-55	600	.....	...	6/12/53
829	28-52	88-45	surface	.....	84.0	9/2/53
851	28-56	89-09	32	.....	...	10/25/53
852	28-51	88-37	380	.....	...	10/25/53
864	29-19	86-04	82	.....	55.0	10/31/53
1006	24-20	83-20	190	.....	51.4	4/13/54
1009	24-34	83-34	200	.....	...	4/14/54
1011	24-28	83-25	200	.....	...	4/14/54
1012	24-19	83-20	180	.....	45.0	4/14/54
1018	24-16	83-22	375	.....	...	4/16/54
1027	25-02	84-23	600-1000	.....	...	4/20/54
1028	28-28	87-18	780	.....	...	4/21/54
1038	25-30	92-00	1729	.....	...	5/10/54
1070	22-30	96-57	1056	.....	...	5/24/54
1077	25-00	96-15	600	.....	...	5/27/54
1086	26-10	96-54	18	.....	75.2	6/3/54
1088	26-10	96-25	40	.....	71.6	6/3/54
1106	29-02	88-35	225	.....	50.4	6/15/54
1273	28-10	87-51	1600	.....	...	3/9/55
1305	27-18	89-25	surface	.....	...	6/5/55

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